AUGUST 1991
ISSUE #371
USA $2.95
CAN $3.95

A WGE Publication

International Edition

73 Amateur Radio Today

EXCLUSIVE! Easiest Packet Ever

PMP
Poor Man's Packet
A Complete Packet Radio Program For The IBM PC
Version 1.00 (beta) Mar 22 1991
Andrew C. Payne, N8KEI
thanks to Kevin Feeney, WB2EMS
Copyright (c) 1989, 1990, 1991 ACP
All rights reserved.
Press any key to continue
#LMCROOPR092 7#480288 5-DIGIT 48103
SERIALS PROCESSING DEPT SAMP
UNIV MICROFILMS IT HAHH
300 N ZEEB RD #NPOB
ANN ARBOR MI 48103-1553
ICOM
IC-2SAT

Build a Computer Interface For your HF Rig

Low Cost Discone Antenna

73 Reviews
Kantronics KTU
TAPR Metcon-1
Packet Gold Software

08
74820 08725 1

THE LAST WORD IN PERFORMANCE

THE ICOM
IC-781
HF TRANSCEIVER

Nothing compares to the captivating experience of operating the finest transceiver on the market, the IC-781. The exhilaration of operating the IC-781 is matched only by the luxury of its crystal clear communications.

Designed for rigorous operation, the IC-781 is the result of extreme dedication, exceptional craftmanship and precision engineering. The IC-781 fuses the perfect blend of features such as driving power, incredible clarity, a Multi-Function CRT Display, Spectrum Scope and Icom's exclusive DDS System to achieve unbeatable HF operation worldwide.

Whether you aspire to DX, contest or enjoy legendary performance, the IC-781 inspires countless hours of devoted attention. Backed by a service commitment second to none, four factory service centers and a one-year factory warranty, the IC-781 characterizes Icom's dedication to excellence.

For full details call the Icom Brochure Hotline at 1-800-999-0377.

CORPORATE HEADQUARTERS:
ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004
CUSTOMER SERVICE HOTLINE (206) 454-7619
CUSTOMER SERVICE CENTERS:
18102 SkyPark South Suite 52-B, Irvine, CA 92714
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
3071 #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada
2380-116th Ave. N.E., Bellevue WA 98004

All stated specifications are subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 7811190

ICOM
First In Communications

CIRCLE 179 ON READER SERVICE CARD

TURN

SIMPLY CONNECT PRIVATE PATCH V TO THE MIC AND SPEAKER JACK OF YOUR BASE . . .

AND YOUR MOBILE BECOMES A PHONE!

Your Radio Into a Phone

PRIVATE PATCH V is the most versatile interconnect available today. A built-in keyboard and digital display give the user full control of all modes and features. PRIVATE PATCH V can be your simplex patch today and your repeater controller with duplex autopatch tomorrow.

When you compare the features and ease of installation, nothing else comes close!

- **FOUR SELECTABLE OPERATING MODES**
  1. **VOX ENHANCED SAMPLING:** A simplex mode permitting mobile break-in. The sample rate is reduced when the land party is speaking.
  2. **STRAIGHT VOX:** A simplex mode free of sampling interruptions, use simplex or through remotely located repeaters to extend range.
  3. **SEMI-DUPLEX:** Use privacy mode if desired.
  4. **REPEATER CONTROLLER:** Will convert any receiver and transmitter into a full featured repeater.
- **BUILT-IN PROGRAMMING KEYBOARD AND DISPLAY**
- **90 NUMBER SPEED-DIALER**
- **LAST NUMBER REDIAL**
- **AUTOMATIC DIALTONE/BUSY DISCONNECT**
- **USER PROGRAMMABLE CW ID**
- **HOOKFLASH**
- **REGENERATED TONE OR PULSE DIALOUT**
- **TOLL RESTRICT**
- **1-800 DIALING**
- **CONNECT CODE**
  Select * plus 1-4 digits. Any combination.
- **TOLL OVERRIDE CONNECT CODE**
  Select * plus 1-4 digits. Any combination.
- **DISCONNECT CODE**
  Select # or # plus connect code digits.
- **CALL LIMIT TIMER**
  Selectable .5-49.5 minutes in .5 min. steps.
- **MOBILE ACTIVITY TIMER**
  Selectable 1-99 seconds in 1 sec. steps.
- **LINE IN USE INHIBIT**
- **CALL WAITING**
- **RINGOUT (REVERSE PATCH)**
  Rings like a phone.
- **TELEPHONE INITIATED REMOTE BASE**
- **REMOTELY CONTROLLABLE RELAY**
  (RELAY OPTIONAL)
- **NON VOLATILE MEMORY**
- **LIGHTNING PROTECTION**
- **COMPACT SIZE 2"H • 11½"W • 7¼"D**
- **ONE YEAR WARRANTY Parts & Labor**

CONNECT SYSTEMS INC.
2064 Eastman Ave., #113
Ventura, CA 93003
Phone (805) 642-7184
FAX (805) 642-7271

TOLL FREE
1-800-545-1349

CIRCLE 12 ON READER SERVICE CARD

LETTERS

From the Hamshack

George Fennell N3EQE, Butler PA A couple of other hams and I have started ATVing in Butler County and are having a ball. P5 audio and video is all around. This is the most fun I've had in ages. I just finished setting in a 10-foot parabolic to do EME and shuttle downlink (to rebroadcast on ATV) and am building a couple of transverters. I also bought a Kenwood 531A 1.2 GHz transceiver, and am building a small 24" parabolic antenna for that. To think that I could be missing all this fun while worrying about upgrading and building code speed. Maybe someday, but definitely not now. We're cooking with microwaves and having a blast. (Must avoid ionization of oneself—did you know that a crack in the waveguide of a 13cm, 1 kW amp 2 1/4" x 1/64" will produce energy 250,000 times the safe [?] exposure limit? WOW—that's what those cramps are!)

You should be starting some stuff for Radio Fun *to help get newcomers interested in ATV, 1200 MHz, and so on. Let's get on the ball and get more hams interested in doing fun things—and perhaps get them off the 20 garbage truck. . . . Wayne*

Ignatius N. Bova WA3GWD, Pittsburgh PA Mr. Jason Kelly's letter *[June '91 issue]* really irritated me. First, I would like to inform him that Morse code was included in the amateur tests for good reason. Our operators could get through under severe QRM using Morse code. Under emergency conditions, where ham operators are counted on to provide critical communications, this is a very valuable asset.

As for the existing amateurs being "a bunch of old men," I can only wonder how he would know. Do ham operators in Iowa give their age as well as their call?

Most ham operators are concerned, and rightly so, that some of the valuable ham bands could turn into another CB fiasco. Back in the 60s, like many ham operators, I read about all the wonderful things CB was going to do for ham radio. CB would "open the door" for many potential ham operators, and this would be the spark that would ignite new interest in this valuable resource. Baloney!

Mr. Kelly, I suggest that you listen in on the CB bands. It would be heart-breaking to have this happen on 2 and 6 meters.

The FCC does not have the resources to control the CB wasteland, and they certainly can't expect more funds with the federal budget bursting at the seams. If we get our bands run over by rude and careless operators, it is doubtful that the FCC could do anything about it, and we would all be the losers because of it.

First, re the code for getting through when conditions are tough. I've heard this claim for 50 years, and as far as I know, there is no authenticated case in the last 30 years of any amateur having to resort to code to get through in an emergency. Yes, of course it's possible. . . it's just incredibly unlikely. With most of today's transceivers not even having a key jack, we may never know.

The old men complaint Kelly makes is echoed dozens of times a month in the mail I'm getting from new hams. It isn't difficult to discover age when you ask a chap what he does and he says he's been retired for 10 years. I finally ran into a non-retired ham last Saturday—first in months.

At a recent hamfest I asked for a show of hands of how many present with General or better licenses would be able to pass a 13 per exam right then. Ten hands went up out of the whole room. A few years ago I proposed as a joke that we all be re-examined for code speed every year. The reaction was one of total panic.

You say "rightfully so" about turning our ham bands into CB. This shows me two things: 1. You haven't listened to 20m for the last year or so. It's worse than any CB I've ever heard. 2. You haven't listened to CB in years.

CB did indeed help us enormously. Until CB came along, we had a negative growth for several years. Almost 100% of our actual growth in the last 20 years has come from people who got started in CB and moved up to hamming.

I'm just back from L.A. I've never heard anything as bad as their 2m repeaters on CB. . . anywhere. And I often take a CB rig with me for use in my rental cars when I travel. I find CBers usually much more helpful than hams if I need to find my way or make a phone call.

Of course, I haven't been to Pittsburgh in years, and you may have a pocket of bad CBers. But remember, only two people in history have been arrested, tried, convicted, and put in prison for bad language on CB. . . and both were Extra Class hams. It's almost enough to make a person think! But maybe not. . . . Wayne

Alan S. Koester NOCALL yet, Coral Springs FL I finally did it! Last night I passed the basic theory tests and became licensed as a no-code Tech. I am anxiously awaiting the arrival of my callsign. Like many others, I felt the code requirement was an obstacle I was not yet ready to overcome. I think that the no-code Tech license is an excellent way to get a taste of amateur radio. From what I have seen and read so far, once the amateur radio bug bites, the effects are permanent. I, too, plan on upgrading to General in the near future. For now, however, my new no-code Tech license will enable me to get started in this great hobby.

My advice for anyone interested in becoming a no-code Tech is to ignore the disgruntled old-timers. We are not "glorified CBers." Good luck to anyone who will be taking the test. Have confidence in yourself. You can do it. I did!

Dorian Blasdell N7PCT, Grants Pass OR In February 1990 I wrote you a letter saying that I couldn't find out where to take the ham radio exams. I believe you printed it in the July 1990 issue.

Here is a progress report. In February 1990 I went to Radio Shack and asked if they knew where the license exams were taking place. They did! I took the Novice, CW, and written exams that month and passed. Then In May 1990 I passed the Technician exam. When December 1990 rolled around, I passed the General and Advanced CW and written exams. Finally in May 1991 I passed the Amateur Extra CW and written exams. I am now 18 years old. Ham radio is lots of fun.

Dorian N7PCT—yes we did print your letter in the July 1990 issue. Thanks for a fine progress report! . . . Linda KA1UKM

Ervin L. Sly W6TKJ, Nipomo CA I fully agree with your statements of last month on the crowded 2 meter band. Just moved from the Los Angeles area and my transceiver would scan all day long and not hear a signal. Once in a while I'd hear someone on the way to work or from work, but the rest of the day—nothing. Simplex? Forget it! Find it even worse here. Also on camping trips I can get into many repeaters but there's never anyone listening. Where do they come up with crowded conditions on 2 meters?

Sure enjoy your ranting and raving.

Gerardo O. Lopez Meza XE1UQL, Veracruz, Mexico Radio communications has been the most important activity of my free time. Unfortunately, I found out about it when I was too old to direct my professional advantages over the area. Anyway, I enjoy it deeply, and I understand that every one of us must increase the interest of the people about the many different things you can do in radio.

Three years after I looked for someone to teach me Morse code, I got my license, then I discovered that almost no one uses it regularly; the amateurs prefer voice 10 to 1. The problem—I think—is that some people use the inexpensive ham bands for business, so the government tests the neophyte's interest by means of the code examination.

There are many repeaters and radio amateurs in Mexico and all Spanish America, and they are always happy to answer every QSO received. In Veracruz we love to talk with other persons from far countries.

I want to express to you my desire for people to use more the 10 meter band and to learn to make QSOs in Spanish. You are losing half of America without this language.

Jeffrey Miller KB2FBI, Austin TX Good issue, the June *73*. You waxed quite eloquent this month. It will take several visits to the euphamism *(sic)* to read it all. Nonetheless, right on the mark about standing around watching the foreigners invent everything new and useful, while the useless simply complain about the new Techies. How about a new bumper sticker? You could make hundred$! "I'll give up CW when they pry my cold, dead hands from my brass key!"

Jim Farago, Minneapolis MN Per the June issue, page 76 on "rigs for kids": In your editorial you talk about how various parts from TV sets could be used to make no-cost QRP rigs and such. I have 40 new B/W picture tubes, 9" through 24", 15 good used ones 4" through 21", plus a few hundred TV tubes, replacement TV antennas, line cords, deflection yokes, etc., all of which I would give away to any interested individual, club, or organization. Schematics, too.

I am not looking for a tax write-off or a trash can—I just hope I can give these items to someone interested. Half of these sets are tube-type and half are transistorized. Brands from A to Z. The TV shops I used to work in are all closed now, so they are no help.

I do not want to put these items out with the trash to end up polluting a landfill.

It was good to speak to you at last November's Hamfest at Hennipin Technical Center, even though you were *much* too busy for any lengthy conversation.

Anyone interested in these parts can contact Jim Farago at 4017 42 Ave. So., Minneapolis MN 55406. PLEASE enclose an SASE. . . . Linda KA1UKM

Tom Rehnert N5PLX, Socorro NM Several years ago I got some mail from you hawking your magazine. I was already familiar with it and planning on someday getting a subscription. What struck me about the mail was that it contained a letter from you that was something like 13 pages long. I thought to myself that this guy must have some great large ego to think I'd read all this. It convinced me to get a subscription. I did read it all. I've been getting a big kick out of your editorials ever since. The magazine is the most fun to read and I always look forward to it.

Charles Holm KB7HUW, Spokane WA I am a Novice operator and enjoy your magazine very much. Your new magazine, *Radio Fun*, looks interesting, and I will be subscribing. Its introduction at this time, now that newcomers can get a license without knowing the code, will certainly help the new operators along, as well as inspire technically inclined people to get a license and join us on the air. You were promoting a no-code license years ago, and predicted its adoption. Again, you were right!

Mike Simmons WB9CWE, Belvidere IL Several months ago, you wrote in a *73* editorial about the hazards of low frequency electromagnetic fields as reported in a very reputable magazine. A few months ago, the XYL of an old acquaintance, Ed Pelc (formerly K9RAX), called us. Grief-stricken, she told us that her husband had been undergoing grueling treatments for leukemia, and she greatly feared for his life. The news had a particularly shocking effect, as Mr. Pelc was a TV repairman; he had spent most of his life surrounded by low level EM radiation in his shop.

As a former quality control engineer, I know that one case is poor proof for anything, but it does make one sit up and take serious notice.

James Moe N6ZOB, Newport Beach CA The April *73* described a DXpedition to Malpelo Island (page 81). These remarkable people operated five radios for about five days and logged 40,000 QSOs.

If they managed to keep all five going for 24 hours/day, this works out to about 66 QSOs/hour per radio. This ought to be considered some sort of a record. It must have been especially tough on a 20 wpm CW operator.

This leaves me wondering—is a 60-second QSO what ham radio is all about?

H.S. Van Winckel VE3FWE, Ontario As a Canadian ham, I have been a long-time fan of yours, having followed your career and agreeing with you on the past, present, and future of amateur radio. Here in Canada, I'm one small voice in the mess that we call ham radio, however I voice my opinions as often as I can. Please keep trying, the Amateur Radio Fraternity needs people like you to remind us of the problems we face.

73 Amateur Radio Today

AUGUST 1991
Issue #371

TABLE OF CONTENTS

FEATURES

8 Poor Man's Packet
A complete software TNC for PC compatibles! WB2EMS, N8KEI

24 Low Cost Discone
Wideband coverage from 144 to 1296 MHz. AD5X

28 High Speed Data Acquisition
Sample the outside world with this inexpensive interface. N8KDD

32 Software for the Ham Shack, Part IV
Useful ham calculations you can program yourself! WA4BLC

38 Universal CAT Interface
Control your rig with your computer! K5YEF

50 Hope for Monolingual Hams
If you really want to communicate! WA1LBP

REVIEWS

20 Pkt-GOLD Multimode
Your software window into the world of digital communications! WA1R

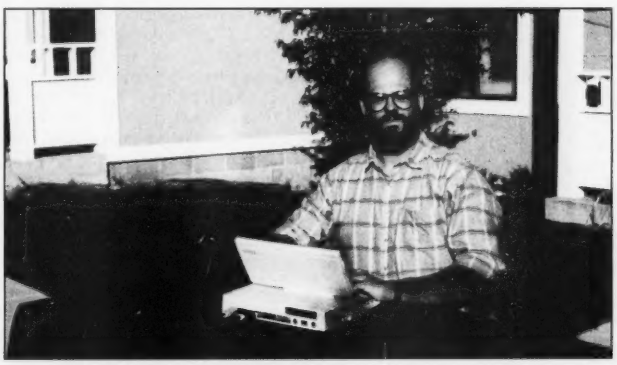
34 The TAPR METCON-1 Kit
Add telemetry and control to your packet station. WB8ELK

46 The Kantronics KTU Telemetry Unit with Weathernode EPROM
Remote weather observations via packet! WA3USG

Poor Man's Packet software TNC for PC compatibles. Cover photo by Larry Dunn.

DEPARTMENTS

62 Above and Beyond
72 Ad Index
79 Ask Kaboom
82 ATV
60 Barter 'n' Buy
49 Dealer Directory
58 DX
17 Feedback Index
54 Hams with Class
56 Hamsats
80 Homing In
2 Letters
4 Never Say Die
70 New Products
84 Propagation
52 QRP
7 QRX
84 Random Output
69 RTTY Loop
76 73 International
66 Special Events
86 Uncle Wayne's Bookshelf
65 Updates



Packet without a TNC? WB2EMS shows you how. . . see page 8.

FEEDBACK. . . FEEDBACK!
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

THE TEAM

PUBLISHER/EDITOR
Wayne Green W2NSD/1
ASSOCIATE PUBLISHER
David Cassidy N1GPH

MANAGING EDITOR
Bill Brown WB8ELK
PRODUCTION EDITOR
Hope Currier
SENIOR EDITOR
Linda Reneau KA1UKM
ASSOCIATE EDITOR
Joyce Sawtelle
CONTRIBUTING EDITORS
Mike Bryce WB8VGE
David Cowhig WA1LBP
Michael Geier KB1UM
Jim Gray W1XU/7
Chuck Houghton WB6IGP
Arnie Johnson N1BAC
Dr. Marc Leavey WA3AJR
Andy MacAllister WA5ZIB
Joe Moell KØOV
Jim Morrissett K6MH
Bill Pasternak WA6ITF
Carole Perry WB2MGP
Bob Winn W5KNE

ADVERTISING SALES REPRESENTATIVES
Dan Harper
Louise O'Sullivan
ACCOUNT SERVICES
Sue Colbert

1-603-525-4201
1-800-225-5083
FAX (603) 525-4423

PRODUCTION MANAGER
William Heydolph
PRODUCTION COORDINATOR
Viki Van Valen
ART DIRECTOR
Alice Scofield
TYPESETTING/PAGINATION
Linda Drew
Ruth Benedict
Steve Jewett
GRAPHIC SERVICES
Dale Williams
Theresa Verville
GRAPHICS PHOTOGRAPHER
Dan Croteau

WGE PUBLISHING INC.
CHIEF FINANCIAL OFFICER
Tim Pelkey
CIRCULATION COORDINATOR
Harvey Chandler
CIRCULATION ASSISTANT
Janet LaFountaine
To subscribe: 1-800-289-0388

Editorial Offices
WGE Center
Forest Road, Hancock NH 03449
603-525-4201, FAX (603) 525-4423
Subscription Services
1-800-289-0388
Colorado/Foreign Subscribers
call 1-303-447-9330

Wayne Green Enterprises is a division of International Data Group.

Reprints: The first copy of an article $3.00 (each additional copy—$1.50). Write to 73 Amateur Radio Magazine, WGE Center, Forest Road, Hancock, NH 03449.

FB

Editorial Offices
WGE Center
Hancock NH 03449
phone: 603-525-4201

Advertising Offices
WGE Center
Hancock NH 03449
phone: 800-225-5083

Circulation Offices
WGE Center
Hancock NH 03449
phone : 603-525-4201

Manuscripts Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon publication. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB" or GEnie address "MAG73") or on disk as an IBM-compatible ASCII file. You can also contact us at the 73 BBS at (603) 525-4438, 300 or 1200 baud, 8 data bits, no parity, one stop bit. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

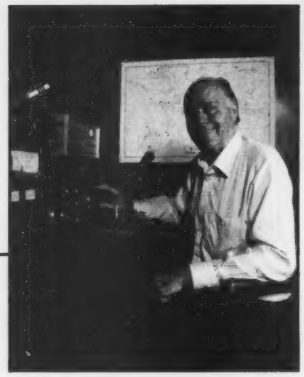
73 Amateur Radio Today (ISSN 1052-2522) is published monthly by WGE Publishing, Inc., WGE Center, Forest Road, Hancock, New Hampshire 03449.

Entire contents ©1991 by WGE Publishing, Inc. No part of this publication may be reproduced without written permission from the publisher.

For Subscription Services write *73 Amateur Radio Today*, PO Box 58866, Boulder, CO 80322-8866, or call 1-800-289-0388. In CO call 1-303-447-9330. The subscription rate is: one year $24.97; two years $39.97. Additional postage for Canada is $7.00 and for other foreign countries, $19.00 surface and $37.00 airmail per year. All foreign orders must be accompanied by payment is US funds. Second class postage paid at Hancock, New Hampshire, and at additional mailing offices. Canadian second class mail registration number 9566. Canadian GST Registration #125393314. Microfilm Edition—University Microfilm, Ann Arbor, MI 48106. Postmaster: send address changes to *73 Amateur Radio Today*, PO Box 58866, Boulder, CO 80322-8866.

Audit Bureau of Circulations (ABC) membership applied for.

Contract: By reading this fine print you are hereby legally obligated to get on the Novice bands and answer a newcomer's CQ. While you're at it, you hereby have one week to say "HI" to a newcomer on your local repeater. Make sure you tell them *73* sent you.



NEVER SAY DIE

Wayne Green W2NSD/1

. . . de W2NSD/1

Humph, sked time and you're late, as usual. How'm I going to get you to shape up and stop being a wishy-washy wimp? And don't try and put on that "sensitive" act with me, I know you too well.

What in heck has happened to you? When you were a kid you had a sense of adventure. You were willing to be a pioneer. Some pioneer you are now! You don't even see the new movies before Ebert tells you whether you're going to like 'em or not. Pioneer? Pfagh! No, most of you've turned into milquetoasts.

Here you are with the greatest opportunity to pioneer in the history of the hobby. So what are you doing, endlessly gabbing on 2m through repeaters or blathering and kvetching about the mess KV4FZ and K1MAN have made on the low bands?

Are you even on packet yet? Or RTTY? The Japanese are busy discovering ways to squeeze high definition TV (HDTV) into narrower bandwidths. They've just announced a new digital audio format, the mini-disc (MD), which crams 74 minutes of digital sound on a 2.5″ disc.

Old-timers will remember the '20s and '30s when Germany had the edge on high technology. German cameras, radios and scientific instruments were the best. Then they got involved with Hitler and screwed up. Through the '40s to the '60s America was way out ahead in almost every technology. The world bought Hallicrafters radios, Kodak cameras and General Radio instruments.

Then Japan discovered Ed Demming and the odd concept that quality really does count. Now we're all buying Japanese cameras, radios and scientific instruments. We're also, in case you haven't noticed, seeing Japanese pioneers skiing down Mt. Everest, crossing the Antarctic on skis, and inventing circles around us in one scientific field after another.

So here you are in amateur radio, firmly stuck in the past, all emotionally worked up over CW, a sad remnant of the '30s. I'll bet 50% of you aren't aware that CW is every bit as important to us today as preserving other antique modes such as AM and spark. Yes, I know, most of the "Spark Forever" crew have their Silent Key awards now and are grumpily moldering. Well, they gave up with the same grace with which our CW-forever brethren are folding their hands . . . buoyed on by the enthusiastic support of the Antique Radio Relay League. Radio *relay*? Har-de-har. Talk about a monument to the past! And let's not even talk about the hoary old goats you've repeatedly elected to help keep amateur radio an archeological resource.

But is amateur radio supposed to be using the incredibly valuable public airwaves as a monument to the past? Aren't we supposed to be experimenting? To be inventing? To be pioneering? Isn't there something in our charter about that? You bet your sweet bippy there is!

So while hordes of you are trying to resuscitate dying technologies such as AM and CW from the dim past, who have we got out there taking advantage of the technological explosion? Certainly not many here in America.

When I speak at hamfests I get blank stares when I bring up new technologies which have been written about recently in *Newsweek* and *Time*. A recent *Forbes* article put our situation into perspective. Today's technology is heading toward the microwaves, where there are more frequencies . . . the frequencies it's going to take to deal with HDTV, personal communicators which handle fax, messaging, and even graphics, computer networking, etc.

So here we are with 500 MHz up there at 10,000–10,500 MHz, with maybe 10 hams in the country using the band. Maybe less. Even if we use today's technology we can get our voice channels down to 5 kHz, which would give us 100,000 channels. Hey, we could all have our own repeater channels and never have to bother talking with anyone else again!

But, as these channels turn from solid gold to platinum, and the commercial demand escalates, unless we're up there doing something of value with 'em, they're going to go. I realize that this is a matter of little moment to most hams. I just don't understand how we ever got amateur radio off 600 meters and up to 160 meters a few generations ago.

That was back when Americans were pioneers. Back when we were eagerly exploring new technologies. Back when Americans were exploring the world. Back when we had some guts. Old-timers will remember Lowell Thomas, Frank Buck, Osa and Martin Johnson, Amelia Earhart, Frank Hawkes, Admiral Byrd.

Old-time hams will remember Copthorne McDonald (SSTV), W2GDG (NBFM), W2BFD (RTTY), W1FZJ (moonbounce and parametric amplifiers). These chaps didn't invent and pioneer to be good guys and save our hobby; they did it because they were having fun. I knew 'em all well. So what's happened to our country that we've stopped having fun with technology? These days 99.9% of us are appliance jockeys.

No, it isn't age. Sam Harris W1FZJ/KP4 was busy pioneering until the day he died. So was John Williams W2BFD. I think I could make a good case for old Doc Spock being at the bottom of this softening of America.

Yes, of course I have a solution. But it isn't one you're going to like. The solution lies in our youngsters. Perhaps we can sneak into our schools and start countering the general concept that technology is bad. Maybe we can get the kids interested in the fun we have to offer . . . not in rag-chewing endlessly, but in experimenting . . . in pioneering new communications.

The food is there on the table, with fascinating stuff from AEA and other ham maufacturers. The question is, how can we get today's hams, starved as they are for excitement and making up for it by making a shambles of our bands, to reach out and even taste the banquet? Please advise. It's out there, waiting. It isn't expensive, but it does mean having to learn . . . and to *dare*.

220 Lives!

A reader, who's in the communications business, advises that while we American hams may not be doing much with 220, there is a brisk business going on just to our south. The drug business in Colombia is apparently delighted with the 220 band and busy buying portable repeaters, HTs with scramblers in hundred lots, mobile transceivers, $15,000 monitors, amplifiers, antennas, night vision equipment, and so on. Hey, they've got to get that cocaine up here for our crack houses, right?

A good friend who ran a ham store in Boston said he often had Hispanic men come into his store with huge rolls of money wanting to buy 144 and 220 MHz repeaters and HTs for cash. Maybe the ham equipment business isn't as badly off as I thought.

Drug dealers make so much money on each delivery that they can afford to buy a repeater and HTs and throw them away after one use. I wonder where the Colombian surplus stores are. There may be some great buys.

U.S. vs. Japan

In case there's a question in your mind about what our new no-code license can do for us, let's just look and see what's happened in Japan, where they've had such a license for years. The May issue of *CQ Ham Radio*, *QST*'s Japanese equivalent, was the usual 586-page phone-book-sized magazine.

Yes, I've been endlessly hearing that unless we keep out the riffraff, we'll end up with one huge CB mess here in America. Well, for more than 20 years we've kept our barriers up to discourage the unwashed hordes, yet when I listen to 20m I hear worse garbage these days than I've heard on CB in years.

So how have the Japanese fared with their no-code licensing? I think we can get a good indication just by looking at their ham magazines . . . which are all monsters compared to the anemic ham magazines we have left here.

Looking over the May *CQHR*, the first 270 pages are solid advertising, mostly in four colors. The last 64 pages of the book are also advertising . . . plus many ads in between. They not only have all the ham gear we have available here, they also have a whole bunch of wonderful products that aren't being exported to the U.S. because our market is too small to bother.

After the front of the magazine advertising section they have 24 pages of fundamental antenna information—how they work—how to use a dip meter to tune your antenna—measuring antenna impedance—how to build a simple Z-meter—building simple low- and high-pass filters—building a 40 meter curtain—and a dozen or so more simple antennas. Then comes IC fundamentals and 14 pages of easy IC building projects.

There's a simple three transistor 10m FM rig construction article, a 440 MHz 25 watt amplifier and a good article on using DAT recorders with amateur radio. There are reviews of a computer logging program, a JRC 0.1–30 MHz receiver, an Azden 10m FM transceiver, a couple of new HTs, and the Yaesu FT-1011 transceiver.

Next comes basic transistor theory, more antenna articles, more simple construction projects, a colorful new products section, DXpedition pictures (in color), hamshack photos, satellite news, DX awards and certificates. The hamfest and club activity photo section has 163 full-color group photos. There are activity report sections for every

Continued on page 73

KENWOOD

Mobile Companion!

TM-241A
TM-441A/TM-541A

Compact FM Mobile transceivers

Here are your new mobile companions — at your service whenever you're on the road! Their compact size makes installation a snap, and the remote control options allow you to customize your installation for that "professional" look!

- **Wide band receiver coverage.** The TM-241A receives from 118–173.995 MHz. Transmit range is 144–148 MHz. (Modifiable for MARS and CAP operation, permits required.)
- **TM-441A** covers 438–449.995 MHz, and the **TM-531A** covers 1240–1299.995 MHz.
- **CTCSS encode built-in, selectable from the front panel.**
- **Selectable frequency steps** for quick and easy QSY.
- **TM-241A provides 50 W. TM-441A 35 W, and TM-541A 10 W.** Three power positions, 5, 10, and full. The TM-541A has two power positions, 1 and 10 watts.
- **20 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2m is automatically selected.** There are **four channels** for "odd split" operation.
- **Tone Alert System with Elapsed Time indicator.**
- **Auto-power off function, and time-out timer.**

RC-20 Remote Control Unit
As supplied, one RC-20 will control one transceiver. **Most often-used front panel functions** are controllable from the RC-20. The RC-20 and IF-20 combine to allow control of up to four radios.

- **Selective calling and pager option.** The DTU-2 option enables the Dual Tone Squelch System (DTSS), allowing selective calling and paging using standard DTMF tones.
- **Digital recording system option.** Used in conjunction with the tone alert system, the DRU-1 allows message storage of up to 32 seconds.
- **Multiple scanning functions.** Band and memory scan, with selectable scan stops and memory channel lock-out.
- **Large LCD display with four-step dimmer control.**
- **Automatic Lock Tuning (ALT) for the TM-541A.** Compensates for drift.

- **Supplied accessories.** Mounting bracket, DC cable, fuses, MC-44DM multi-function DTMF mic.

Optional accessories

• **DRU-1** Digital Recording Unit • **DTU-2** DTSS unit • **IF-20** Interface unit, used with the RC-20, allows more than two transceivers to be remotely controlled • **MA-700** 2m/70cm dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mounting bracket • **MC-44** Multi-function hand microphone • **MC-55** (8-pin) Mobile mic. with time-out timer • **MC-60A, MC-80, MC-85** Base station mics. • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **PG-4G** Extra control cable • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **PS-50/PS-430** DC power supplies • **RC-10** Handset remote controller • **RC-20** Remote control head • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **TSU-6** Programmable CTCSS decoder

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD

...pacesetter in Amateur Radio

Specifications guaranteed for Amateur band use only.

KENWOOD

Compact Champion!

TH-27A/47A

2 m and 70 cm Super Compact HTs

Here is a great new addition to Kenwood's HT family – the all new TH-27A for 2 meters and TH-47A for 70 cm! Super compact and beautifully designed, these pocket-sized twins give you full-size performance.

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118–165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only, (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with programmable timer.
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!
- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)

Optional accessories:
- **BC-14:** Wall charger for PB-13
- **BC-15:** Rapid charger for PB-13, 14
- **BC-16:** Wall charger for PB-14
- **BH-8:** Swivel mount
- **BT-8:** Six cell AA Alkaline battery case
- **HMC-2:** Headset with VOX and PTT
- **PB-13:** 7.2 V, 700 mAh NiCd pack
- **PB-14:** 12 V, 300 mAh NiCd pack
- **PG-3F:** DC cable with filter and cigarette lighter plug
- **PG-2W:** DC cable
- **SC-31:** Soft case
- **SMC-31:** Standard speaker mic
- **SMC-32:** Compact speaker mic
- **SMC-33:** Compact speaker mic with controls
- **WR-2:** Water resistant bag.

- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

Specifications and features are subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD

...pacesetter in Amateur Radio

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Ham Physicians Speak Up

"Only a person familiar with both medicine and amateur radio can make this determination correctly," writes Christine Haycock, M.D., WB2YBA, in a letter to fellow physicians published in *New Jersey Medicine*. She is referring, of course, to the telegraphy waiver for handicapped hams. In December 1990 the FCC passed Docket 90-356, exempting handicapped persons from code tests if their physical condition prevents them from learning the code at 13 or 20 wpm. Dr. Haycock notes: "Totally handicapped quadriplegics have mastered these requirements, as well as blind or deaf individuals, and the psychological benefits of this achievement are immeasurable. There are, however, some rare instances where an individual cannot meet this goal, hence the FCC edict."

Morris Soled, M.D., W2NXS advises non-ham colleagues that "Ham radio is a popular hobby among physicians, and you should be able to find a member of your staff to answer further questions before being a 'nice guy' and signing a note you do not understand."

Dr. Edward N. Ludin, M.D., K2UK, president of the Medical Amateur Radio Council, Ltd., MARCO, was also published. He notes that the precise meaning of "severely handicapped individual" is unclear in relation to the Act *[the 1988 Developmental Disabilities Act, 29 USC 706(15)(A)(III)]*, and that the average physician ". . . could not be expected to know what effect these disabilities may have on [a person's ability in] learning Morse code." Like Doctors Haycock and Soled, he urges physicians to not sign a certificate of exemption lightly. He says, ". . . please request, from a local amateur operator, preferably another physician, appropriate advice. I hope that other physician hams will let their fellow physicians at the local level know of their availability in this regard." TNX *W5YI Report, Vol. 13, Issue 12.*

A Brave Young Ham

One of the highlights of K6IR's trek to the Dayton Hamvention was meeting Seth XU1SS from Kampuchea. "What a fascinating story of bravery and hardship," K6IR writes us. "Seth's amateur radio operations from the jungles of Kampuchea using the call XU1SS while under enemy gunfire . . . his heroic escape from Kampuchea . . . and his ultimate reunion, after over a decade of separation, with his family in Washington State after the death of his brother . . . all add up to a tale worthy of a suspenseful movie. The enclosed photo of this brave young man *[see Photo A]* who has endured so much belies the tragedies he has endured in his young life. Seth is truly a remarkable young man and an outstanding tribute to our worldwide hobby of amateur radio." TNX Kenneth M. Miller K6IR.

Photo A. Seth XU1SS (left) from Kampuchea and Ken Miller K6IR (right) meet at the Dayton Hamvention.

Mir Wants News!

U5MIR requests packet stations leaving messages on U5MIR-1 to include news—most messages are boring! KP4BJD had the ". . . unique opportunity, the rare pleasure, to QSO in FM voice with cosmonaut Sergey Krikalev U5MIR for about two minutes . . ." last June. He lists four messages from Sergey: 1. He sends to all: Greetings from space! 2. He congratulates the ship crew and NASA for the successful launch of mission STS-40 and the shuttle *Columbia*, and looks forward to making a QSO in FM voice when their footprints overlap. 3. He respectfully requests all the earth packet stations leaving messages on U5MIR to please kindly include news; they need entertainment, and the usual content of the messages they now receive is boring. 4. Sergey will be available on his "free time" for more FM voice QSOs on 145.55 MHz. *Dosvidaniya* to all from space. De KP4BJD @ KP4GE.PR.USA.CARB.

No American Woodpecker

The U.S. Air Force has scrapped its plans for an over-the-horizon backscatter (OTH-B) radar system, according to *Jane's Defense Weekly*. The program has been called the "American Woodpecker" because its Soviet counterpart is known as the "Russian Woodpecker." The interference this system causes in shortwave communications resembles the pecking of a woodpecker.

The American OTH-B would have had a range 10 times greater than that of conventional radar, and served as an early warning system. General Electric was to build four systems spanning the Northeast, West Coast, Alaska, and north-central states. The decision to scrap this project will help alleviate the fear of increased QRM to HF communications on the ham bands. TNX *Westlink Report, No. 602. (The major details of the OTH-B project was reported in "QRX" in the August 1990 issue.)*

No-Code ROs

Where it can legally do so, the FCC is relaxing its rules which require radio officers with Morse code proficiency on board ocean-going vessels. Recently, the Commission amended its rules to permit small passenger ships weighing under 100 gross tons to operate under the general exemption from the manual Morse code radiotelegraph station requirements beyond the current 100 nautical mile limit. TNX *W5YI Report, Vol. 13, Issue 12.*

Poor Man's Packet

A complete software TNC for PC compatibles!

F. Kevin Feeney WB2EMS and Andy Payne N8KEI

Poor Man's Packet (PMP) was conceived in the fall of 1988. Andy Payne N8KEI, an electrical engineering student at Cornell University, wanted to get into packet but a TNC wasn't within his student's budget. He was sure he could write a software TNC for IBM PCs and compatibles. I'd been involved in packet for several years, but I wanted a more compact means of operating portable with my new laptop computer—like a software TNC running on the laptop with a small modem interface. Andy and I ran into each other on the local repeater, met to exhange ideas, and PMP was born.

A regular TNC consists of a dedicated microcomputer, some software in ROM, a simple Bell 202 modem, perhaps an HDLC chip or a Data Carrier Detect (DCD) circuit, and some "glue" chips to tie everything together. Most people then hook up this specialized little microcomputer device to a personal computer of considerably more power and capacity. The processing power of the PC is mostly wasted, used only to loop on a simple terminal program, shuffling keystrokes to the TNC and bytes from the TNC to the screen.

What is PMP?

PMP approaches the task from a different direction, using the PC to do the work of the dedicated microcontroller. The software is on disk instead of in ROM. Hardware HDLC and DCD circuits are nice, but not necessary for simple TNC implementation. The modem is a simple, one-chip, external design that the software accesses via the handshake lines on the printer port. The terminal interface functions are built right into the program, with direct access to the screen and keyboard. Instead of storing operating parameters such as callsign, transmit delays, or number of retrys in a non-volatile memory like a regular TNC, PMP reads them in on startup from a configuration file.

Using this design, you can build a simple, inexpensive packet communications system. PMP won't support multiple connects or act as a black box TNC for use as part of a BBS, but it's good for the usual connections to the local BBS to read and post mail, for getting your feet wet in packet, and for portable or emergency operation. *[Ed. Note: The PMP program is available from the author as well as the 73 BBS at (603) 525-4438.]*

How It Works

To transmit a packet, the software builds the packet up from the entered data. It then commands data bit D1 (pin 3) on the printer port HIGH, turning Q2 on and keying the radio. Then the software begins toggling the D0 bit (pin 2) back and forth, sending the packet "flags" to open up the distant receiver and synchronize the demodulator. After the flags are sent, the software sends the actual data in the packet, then more flags at the end. Finally, the software turns off D1 and the radio unkeys.

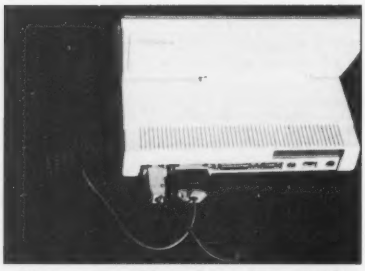


Photo A. Portable packet without a TNC!

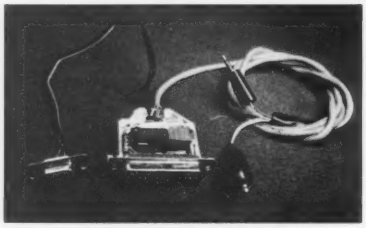


Photo B. The interface installs easily between your computer and radio.

Receiving packets is a little more complicated. While the radio is squelched, the Carrier Detect output (CDT—pin 3 of the 3105) is held LOW. The software "watches" this by looking at the printer port BUSY line (pin 11) indicating that packets are presently incoming, which frees the software to handle the keyboard processing, disk operations, and screen updates.

When the radio unsquelches and sufficient audio starts coming into the chip, the CDT line goes HIGH, signalling the software to "drop everything" by disabling interrupts. It starts timing the 1 and 0 transitions coming from the modem on the Receive Data line (RXD—pin 8 of the 3105).

It does this until the radio squelches and the CDT line goes high again, at which point the software translates the data it has just received from NRZI bit flips into ASCII and displays it on the screen. The program then goes on to handle the other tasks that were shut off during the incoming packet.

The Modem

While Andy was cooking up the software, I started building modems. I evaluated several of the chips available. The EXAR 2211/2206 are used in several commercial TNCs, but they can be finicky to tune and keep tuned, and I was concerned about temperature swings while portable.

The AMD 7910 World Chip offers several modem frequencies, including some suitable for HF packet, but it's physically large and requires three operating voltages.

Texas Instruments' TCM3105 won out. It has a Bell 202 half duplex modem that requires a minimum of external parts, crystal controlled stability, and low current drain, all in a 16-pin DIP. The final circuit is shown in Figure 1.

Starting in the upper left, U1, a 78L05 miniature voltage regulator drops the incoming voltage to 5 volts for the modem chip. C1 keeps the regulator stable when the power source is more than a few inches away.

Pin 2 is the clock drive output. To generate Bell 202 tones, the TCM3105 requires that an inverted clock be fed into Pin 5. The clock drive from pin 2 is fed into the base of Q1 through R4 to limit the base drive, and the inverted output is taken off the junction of the collector and R3, and fed back into Pin 5.

Pin 3 is the Carrier Detect output from the modem. The TCM3105 senses the audio energy coming into it and raises the line HIGH when the audio is sufficiently strong. Andy's software reads this line via the BUSY line of the printer port (pin 11), and starts trying to decode incoming packets whenever it is HIGH. The chip does not do any filtering or check to see if the incoming signal has the proper tones; it simply reacts to audio level. This means random noise or an unsquelched receiver can trip the line and start the sofware trying to decode. Unlike more complicated circuits with a DCD detector, PMP depends entirely on the radio's squelch to tell when an incoming packet is arriving.

Pin 4 is the receive audio input. C3 provides AC coupling so the internal bias network in the chip isn't dragged down. Initially I had very poor receive results until I figured out I had forgotten this capacitor.

D1 and D2 provide clipping of the signal to protect the modem's input circuit if the audio is

Revolutionary NEW . . .
MFJ SWR Analyzer

MFJ's innovative new SWR Analyzer gives you a *complete* picture of your antenna SWR over an entire band — *without* a transmitter, SWR meter or *any* other equipment!

All you do is plug your antenna into the coax connector, set your SWR Analyzer to the frequency you want and read your SWR.

Setting up and trimming your antenna: Super simple and super accurate

You can instantly find your antenna's true resonant frequency right at your feedline -- that's something a noise bridge just can't do.

You can monitor SWR changes as you adjust your beam or vertical — you'll know right away which way to adjust it.

You can shorten or lengthen your dipole and see the effect immediately.

The MFJ SWR Analyzer is battery operated and handheld size so you can take it right to your antenna. It makes it sooooo easy to work on your antenna until it's just the way you want it.

Create your perfect multi-band antenna

You can instantly check multi-band dipoles and trap verticals to see if the low SWR points are where you want them and adjust your antenna until they're right.

Mobile Antennas made easy

You'll find the perfect adjustment for your mobile whip in seconds by actually seeing the SWR as you pull the whip in and out without transmitting

You can easily find the ideal place on the car for your mobile antenna by checking different spots with the SWR Analyzer.

All kinds of uses

You can see how the SWR varies over your entire band and quickly find your usable 2:1 SWR bandwidth.

You can see your SWR change as you drive under an overpass and see how mobile whip flutter affects SWR.

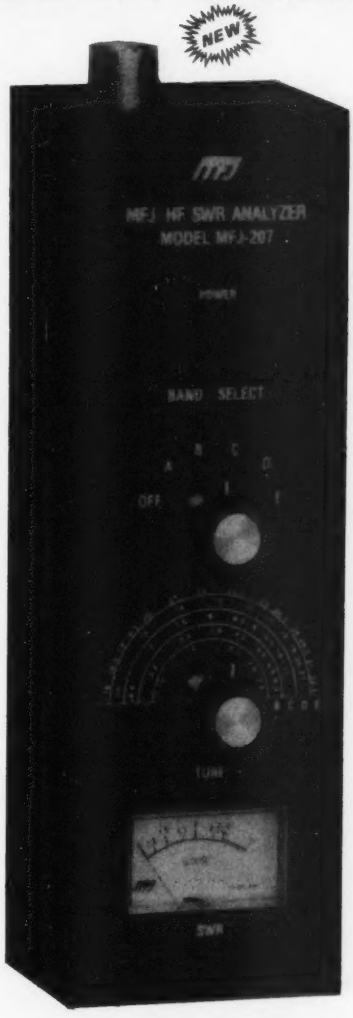
You can see what happens as you swing your beam toward the power line or away from your tower.

You can see how rain or snow affects your beam.

You can tune up your antenna tuner without transmitting.

You can check the SWR of the input to your linear amplifier.

You'll find all kinds of uses for this totally self-contained handheld unit that'll revolutionize how SWR is measured.



MFJ-207 **$99.95**

Super Value: Several Instruments in One

You get a super value because several instruments are combined into a single portable handheld unit.

It has a low distortion RF generator that covers 10-160 meters, an SWR bridge that gives forward and reflected components and a computing circuit that automatically computes the SWR and displays it on the meter.

Everything is automatic. All you do is set the frequency and read SWR. It also has a frequency counter output so you can connect a frequency counter for precise digital readout.

Use 9 volt battery or 110 VAC with MFJ-1312, $12.95. 7½" x 2½" x2¼".

The best way ever to measure SWR

Here's the best way ever to measure SWR . . . so get yours today!

MFJ VHF SWR Analyzer

MFJ-208

$89.95 NEW

If you operate 2 meters this new MFJ-208 VHF SWR Analyzer helps get your antennas in tip-top shape. Just plug in the coax to find the SWR of any antenna from 142-156 MHz. Use 9 volt battery (not included) or 110 VAC with MFJ-1312, $12.95.

MFJ Low Pass Filter

NEW

MFJ-704

$39.95

Now you can eliminate or minimize TVI problems caused by harmonics with this new MFJ Low Pass Filter that connects between your transceiver and antenna. It's the best way to ensure that your transceiver does not cause harmonic interference to your neighbors' TVs -- you can operate in peace while your TV watching neighbors completely miss out on the fun of ham radio.

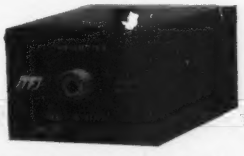
Handles full legal power from 0 to 30 MHz. SWR below 1.15:1 to 30 MHz. High harmonic attenuation. Low insertion loss. One year unconditional guarantee.

W9INN Balun Box

NEW

MFJ-912

$39.95



Permits using coax from your wide range T-network tuner to the MFJ-912 W9INN Balun Box mounted outside the building. The MFJ-912 then converts the unbalanced coax to the balanced transmission line (ladder line). Provides the same function as the internal balun except it is located remotely from the tuner.

With an adequate tuner will permit feeding any balanced transmission line this way.

Retains flexibility and efficiency of the ladder line feed without bringing the ladder line into the shack. One year unconditional guarantee.

DC-650 MHz Dummy Load

MFJ-264

$64.95

One dummy load that covers 160 Meters through 650 MHz and QRP through 1500 watts!

SWR is below 1.1:1 to 30 MHz, below 1.3:1 to **650 MHz.** Run 1500 watts for 10 seconds, 100 watts for 10 minutes. 3" x 3" x 7". Guarantee.

Nearest Dealer/Orders: 800-647-1800

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; **TELEX:** 53 4590
FAX: (601) 323-6551; Add $5 s/h.

MFJ . . . making quality affordable

© 1991 MFJ Enterprises, Inc.

Prices and specifications subject to change without notice or obligation.

CIRCLE 86 ON READER SERVICE CARD

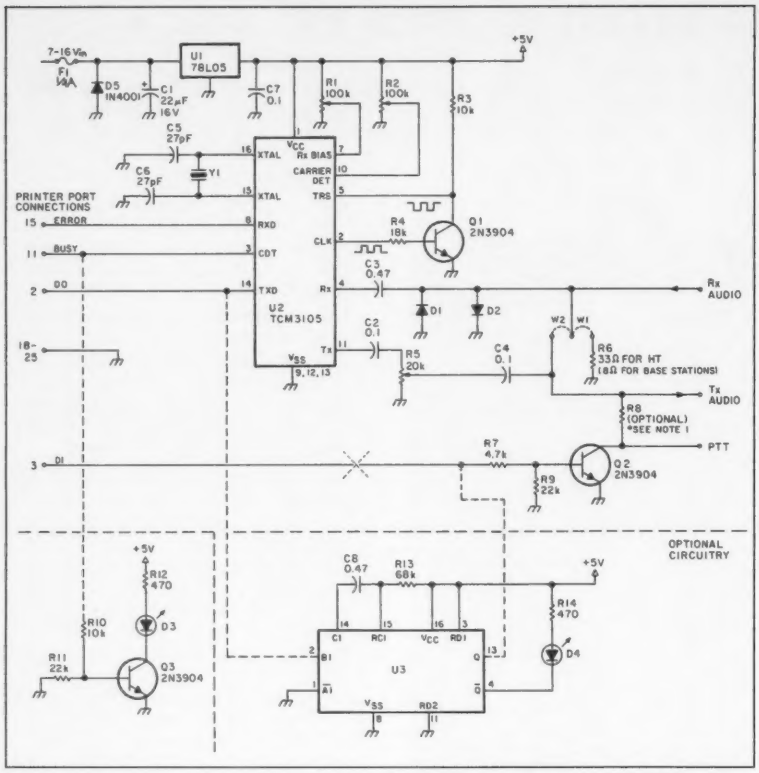


Figure 1. Schematic diagram of the modem interface. The bare bones laptop interface is shown above the dotted line. Use the whole schematic for the home station interface (includes a watchdog timer circuit).

cranked up too high. Even with an HT it's possible to develop enough voltage to damage the chip. The diodes limit the voltage to about 600–700 mV peak. Resistor R6 provides a load for the receiver. Since I generally use my modem with an HT, I put 33 ohms at R6 since that is a good match for the HT's output impedance and takes less power from the rig to drive. If you are operating with a base or mobile radio, you may want to change this to 8 ohms, and make it a 1 watt resistor, in case the audio gets cranked up by accident. This is easy to do when you aren't actually listening to the signal.

Pin 7 is the Receive Bias threshold adjustment. The voltage here determines how the incoming tones are divided into ones and zero. It requires careful adjustment. A 10-turn pot is recommended for fine adjustments.

Pin 8 is the Received Data output from the modem to the computer. It sends the ones and zeros from the modem to the software via the printer ERROR input line (pin 15 of the printer port).

Pin 10 is the Carrier Detect threshold adjustment, similar to pin 7 but not as critical in adjustment.

Pin 11 is the transmit audio output from the modem. C2 provides AC coupling, R5 allows adjustment of the audio level, and C4 breaks the DC path to the transmitter in case it has a DC bias, like the input circuits of many HTs.

Pin 14 is the transmit digital data from the software to the modem. It comes out from the D0 bit (pin 2) on the printer port and causes the modem tone output to switch between 1200 and 2200 Hz with the zeros and ones.

PTT for the modem is arranged by driving the D1 bit of the printer port (pin 3) HIGH. This output drives Q2 through R7, pulling the transistor's output LOW and keying the rig. Q2 can handle about 50 mA. For use with ICOM style HT keying, resistor R8 should be connected between the transmit audio line and the collector of Q2.

For radios with separate PTT lines, R8 should be eliminated. I have found values between 4.7k and 12k to work well at R8. If the resistance is too high, the radio won't key reliably. If it's too low, the transmit audio may be shunted to ground. In using the modem with an ICOM HT, I found that if the transmit gain is set too high, the radio will key as soon as the microphone plug is installed. I believe this is due to the negative-going swings of the audio pulling current from the HT keying circuit and turning it on. I just adjust the transmit gain pot R5 until the radio unkeys. At that level it is far too high for proper modulation anyway.

Assembly and Tuneup

I have built a number of these modems in different configurations. If you are brave of heart and steady of hand, it is possible to cram the entire modem into a DB-25 connector housing, which can then plug directly into the back of a laptop with only a cable to the radio. I've managed it twice, and if you can steal power from the serial port to run it, it makes the sweetest little portable packet setup you ever saw. If you do try it, start with a 16-pin DIP socket and get the smallest pots you can. Mine has a couple of layers of components in one area, separated by tape. Be creative and know it *can* be done.

For those less fanatic builders, the modem can easily be built on a 1.6" x 2" piece of vectorboard. You can either attach the board directly to the DB-25 connector by wedging the board between the rows of pins and applying some epoxy (after making the required connections!), or you can separate the board and the connector with a short, 5-wire cable. Parts layout on the modem is not critical, except to keep the connections around the crystal short. I have built 10 modems with six different layouts from "crammed" to "wide open spaces," and none has failed to work.

A PC board is available to help in assembly (see the Parts List and Figures 2 and 3). Two versions of the modem interface are shown. The smaller board in Figure 2 is designed for portable laptop operation. While the larger circuit shown in Figure 3 can be used for portable laptop use, it is best used for a home computer installation where you plan to leave the modem interface hooked up for long periods. The home interface draws more current and needs a separate power supply (either from a 9-volt battery or DC wall supply).

Parts list

U1	78L05	5-volt regulator
U2	TI TCM3105JL	1200 bps half duplex modem chip
U3	74LS123	one-shot multivibrator
Y1	4.433619 MHz crystal	European colorburst frequency
Q1,Q2,Q3	2N3904	or 2N2222, etc.
D1,D2	1N914 or 1N4148	switching diodes
D3,D4	LEDs	red for D4, green for D3
D5	1N4001 diode	
C1	22 µF, 16V	tantalum capacitor
C2,C4,C7	0.1 µF	
C3	0.47 µF (0.33 to 1 µF can be used)	
C5,C6	20 to 30 pF	
C8	0.47 µF	
R1,R2	100k trimpot	multi-turn
R3,R10	10k	
R4	18k R5	20ktrim pot
R6	33 ohm for HT use	8 ohm, 1 Watt for base/mobile use
R7	4.7k	
R8	4.7k to 12k (10k nomimal)adjust for keying HT (optional)	
R9,R11	22k R12,R14	470 ohms
R13	68k	
F1	¼ amp fuse	

Most parts are readily available, with the exception of the modem chip and crystal. These can be obtained from your local Texas Instruments distributor. F. Kevin Feeney WB2EMS can supply a chip/crystal pair for $24 as well as blank PC boards for $7 each (see author's bio for address). Kits may also be available. Contact the authors for details. The software, including source code, is available from the authors on disk for $10 and from various sites on Internet. You can also download PMP from the *73* BBS at (603) 525-4438. Look under the *73* MAG SIG.

HF Equipment	Regular	SALE
IC-781 Xcvr/ps/tuner/scope • *Special*/$6149.00		**4999**

IC-765 Xcvr/ps/keyer/tuner..... $2692.00 **2399**

IC-751A 9-band xcvr/.1-30 MHz rx...	$1699.00	**1399**
PS-35 Internal power supply.....	219.00	**199**95
FL-63A 250 Hz CW filter (Ist IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	**109**95
FL-53A 250 Hz CW filter (2nd IF)	115.00	**109**95
FL-70 2.8 kHz wide SSB filter	59.00	
IC-735 HF xcvr/SW rcvr/mic.....	1149.00	**969**95
PS-55 External power supply	219.00	**199**95
AT-150 Automatic antenna tuner	445.00	**389**95
FL-32A 500 Hz CW filter.....	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder.....	18.50	

IC-725 HF xcvr/SW rcvr	$949.00	**799**95
AH-3 Automatic antenna tuner	489.00	**429**95
IC-726 10-band xcvr w/6m.....	1299.00	**1089**

HF Accessories:	Regular	SALE
IC-2KL HF solid state amp w/ps	$1999.00	**1699**
IC-4KL HF 1 kw amp w/ps • *Special*..	6995.00	**5795**
EX-627 Auto ant selector • *Special*.....	315.00	**269**95
PS-15 20A external power supply	175.00	**159**95
PS-30 Systems p/s w/cord, 6 pin plug	349.00	**319**95
SP-3 External speaker.....	65.00	
SP-7 Small external speaker.....	51.99	
CR-64 High stab. ref. xtal; 751A, etc	79.00	
SM-6 Desk microphone	47.95	
SM-8 Desk mic; two cables, scan	89.00	
AT-500 500w 9 band auto ant tuner.....	589.00	**519**95
AH-2 8-band tuner w/mount & whip.....	758.00	**689**95

Call for Prices on accessories for IC-781/765/726/725

ICOM

★ Large Stocks
★ Fast Service
★ Top Trades at **AES**

VHF/UHF Base Transceivers	Regular	SALE
IC-275A 25w 2m FM/SSB/CW w/ps.....	$1299.00	**1129**
IC-275H 100w 2m FM/SSB/CW.....	1399.00	**1199**
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	**1199**
IC-475H 100w 440 FM/SSB/CW	1599.00	**1399**
IC-575A 25w 6/10m xcvr/ps	1399.00	**1199**
IC-575H 25w 100w 6/10m xcvr	699.00	**1469**
IC-1275A 10w 1.2GHz FM/SSB/CW	1849.00	**1599**

VHF/UHF FM Transceivers	Regular	SALE
IC-229A 25w 2m FM/TTP mic	$423.00	**369**95
IC-229H 50w 2m FM/TTP mic	462.00	**399**95
IC-448A 25w 440 FM/TTP • *Closeout*	599.00	**469**95
IC-1201 10W 1.2GHz FM xcvr.....	799.00	**699**95
Dual band FM Transceivers	Regular	SALE
IC-3220A 25w 2m/440 FM/TTP mic	$659.00	**569**95
IC-3220H 45w 2m/35w 440 FM/TTP	699.00	**599**95
IC-2400A 2m/440 FM/TTP • *Special*.....	899.00	**639**95
IC-2500A 440/1.2GHz FM • *Special*.....	999.00	**849**95
Multi-band FM Transceivers	Regular	SALE
IC-901 2m/440 xcvr • *Special*.....	$999.00	**869**95
UX-R91A Broad band receiver unit	389.00	**349**95
UX-19A 10w 10m unit.....	299.00	**269**95
UX-59A 10w 6m unit.....	349.00	**319**95
UX-S92A 2m SSB/CW module.	599.00	**529**95
UX-39A 25w 220MHz unit	349.00	**319**95
UX-S94A 430MHz SSB/CW module.....	TBA	
UX-129A 10w 1.2GHz unit.....	549.00	**499**95
IC-970A 25w 2m/430MHz transceiver ..	2895.00	**2499**
IC-970H 45w 2m/430 MHz transceiver .	3149.00	**2699**
UX-R96 50-905 MHz receive unit.....	389.00	**349**95
UX-97 1.2GHz band unit	999.00	**869**95
VHF/UHF Mobile Antenna	Regular	SALE
AH-32 2m/440 Dual Band mobile ant.....	$39.00	
AHB-32 Trunk lip mount.....	35.00	
Larsen PO-K Roof mount	23.00	
Larsen PO-TLM Trunk-lip mount.....	24.70	
Larsen PO-MM Magnetic mount	28.75	
VHF/UHF Repeaters	Regular	SALE
RP-1510 2m 25w repeater.....	$1849.00	**1649**
RP-2210 220MHz 25w rptr • *Special*...	1649.00	**1399**
RP-4020 440MHz 25w repeater.	2299.00	**1999**
RP-1220 1.2GHz 10w repeater	2599.00	**2249**

Handhelds	Regular	SALE
IC-02AT/High Power 2m ...	$409.00	**349**95
IC-04AT 440 HT • *Closeout*	449.00	**329**95
IC-2SA 2m HT • *Special*.....	419.00	**289**95
IC-2SAT 2m/TTP • *Special*.	439.00	**319**95
IC-3SAT 220MHz HT/TTP.....	449.00	**369**95
IC-4SAT 440MHz HT/TTP.....	449.00	**369**95
IC-2GAT 2m HT/TTP	429.00	**379**95
IC-4GAT 440MHz/TTP.....	449.00	**369**95
IC-12GAT 1.2GHz/TTP	529.00	**469**95
IC-W2A 2m/440 HT.....	629.00	**529**95
IC-24AT 2m/440 HT.....	565.00	**419**95

Handhelds for Aircraft band	Regular	SALE
A-2 5W PEP synth aircraft HT	525.00	**479**95
A-20 Synth. aircraft w/VOR • *Special*..	625.00	**499**95

Call for information and Prices on accessories for Handhelds listed above.

Shortwave Receivers	Regular	SALE
R-7000 25MHz-2GHz receiver.....	$1199.00	**1029**
RC-12 Infrared remote controller.....	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit.....	139.00	**129**95
R-71A 100kHz-30MHz rcvr.....	999.00	**869**95
RC-11 Infrared remote controller.....	70.99	
FL-32A 500 Hz CW filter.....	59.00	
FL-63A 250 Hz CW filter (Ist IF)	59.00	
FL-44A SSB filter (2nd IF).....	178.00	**159**95
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stablity oscillator xtal.....	79.00	
SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option.....	12.99	
MB-12 Mobile mount	25.99	

R-9000 100kHz-2GHz all mode rec .. $5459.00 **4699**

Top Trades! ★ We'll take your Clean Late Model Gear in trade toward New **ICOM** Equipment.

Write or Call for our Quote Today!

Toll Free

MasterCard VISA DISCOVER Use your CREDIT CARD AMERICAN EXPRESS

AES® Over 34 Years in Amateur Radio
HOURS • Mon-Fri 9-5:30; Sat 9-3

Order Toll Free: 1-800-558-0411 *FAX: (414) 358-3337*

AMATEUR ELECTRONIC SUPPLY® Inc.

5710 W. Good Hope Road; Milwaukee, WI 53223 • Phone (414) 358-0333

AES BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (407) 894-3238
1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No Toll Free Line

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
1-800-634-6227

Associate Store
CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
1-800-621-5802

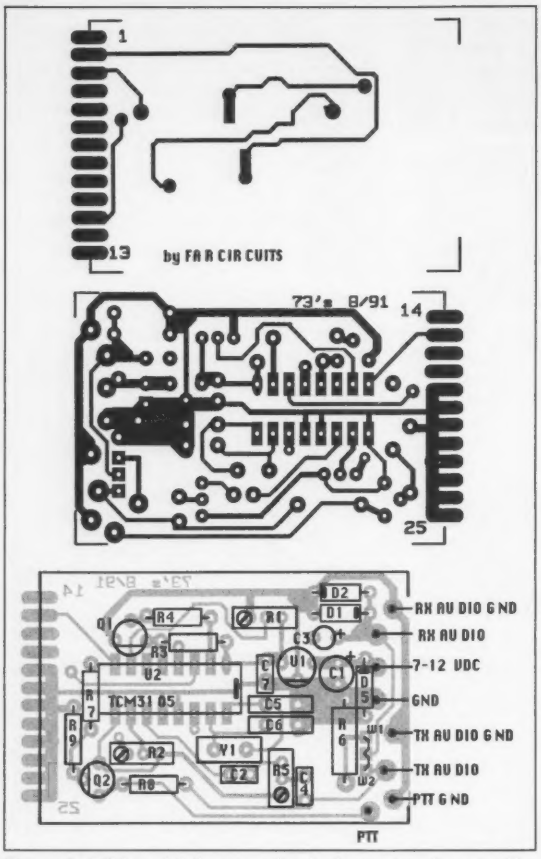


Figure 2. PC board foil pattern for the laptop interface. (a) Top layer (solder the top pads as well as on the bottom). (b) Bottom layer. (c) Parts placement.

Why two versions of the modem? In the interest of portability, the laptop interface lacks a time-out circuit to make it as small as possible. It is designed to be hooked up only when you want to operate packet. The problem is that when you exit the PMP program (or if the computer resets itself), the laptop interface may key down your transmitter continuously (a detailed explanation of this appears in the "Enhancing PMP" section of this article). This is not a problem when you are actually running the PMP program, however. The larger home station interface (Figure 3) solves this with a watchdog circuit and can be left hooked up to your parallel port indefinitely. Just remember: **When using the scaled-down laptop interface, always disconnect it from your computer when you're done operating packet!**

To assemble the laptop interface, just slide the PC board between the rear pins of the DB-25 connector and solder in place. Install the components and make up cables to run to your radio. The interface can be powered by running a cable over to the serial port. (See Figure 3 for serial port connection).

The laptop interface board will fit into the Radio Shack transmitter case (RS # 270–293). The end panel of the case should be notched out to mount the DB-25 connector. Use washers to space the connector away from the end panel far enough so that the PC board just fits into the compartment. This "transmitter case" has an internal space specifically designed for an optional 9-volt battery as well.

The home station modem interface requires a larger case. Also you will have to wire up a cable to run over to your computer's parallel port. See Figure 3 for details.

Checkout and Adjustments

After construction is completed, apply power to the modem with the TCM3105 chip unsocketed. You should have 5 volts on pin 1. If not, check the regulator chip U1 and associated wiring. Check pin 7 and adjust R1 initially for a voltage of 2.26 VDC. Check pin 10 and adjust R2 for 2.5 volts. Next, remove the power and insert U2. Connect the modem to the computer and the receive audio line to the radio. Don't connect the transmit line at this point. Boot up the computer, load the disk, and type PMP to start the program. When the title screen appears, press any key to go to the operating screen.

To adjust the Carrier Detect threshold pot, R2, connect the receiver and squelch the radio. Turn R2 until the RX indicator in the lower right corner of the screen disappears. The RX indicator is tied to the operation of the CDT line. It indicates when PMP starts to attempt decoding packets. Now unsquelch the radio and turn up the volume until it reappears. Resquelch the radio and be sure it disappears immediately. The object is to have the CDT line quickly and cleanly follow the operation of the radio's squelch. If R2 is set too close to the threshold, the CDT line will not follow the closing of the radio's squelch quickly enough. If the RX symbol on the screen never goes away, make sure you have the modem plugged securely onto the printer port, that it has power applied, and that pin 3 of the modem chip is wired correctly to pin 11 on the printer port connector.

To set the RX bias, set R1 for a reading of 2.26 volts at pin 7 of U2; that is a good starting value. When you begin listening to actual packets, if they are not being printed on the screen, you can rock R1 back and forth until you start copying packets. It helps to have a nearby friend send a bunch of beacons or unprotocoled packets for this. Andy has written a supplementary program called PMPTEST that simplifies this process by giving an indication of how closely adjusted R1 is. Using the program and listening to on-the-air packets will get R1 dialed in pretty quickly.

To adjust the transmit audio, send packets while listening on a second receiver. Adjust R5 until the audio stops increasing, then back it off until the audio just starts to diminish. This should put you near the edge of limiting and give you the cleanest audio. The adjustment isn't very critical, but if you are having problems communicating with a particular station, you may need to rock it a little near that threshold of limiting to account for the "twist" between the 1200 and 2200 Hz tones.

Easy Operation

To set up PMP for operation, you first have to edit the configuration file. This is where you tell PMP your callsign, and other information, such as how long you need to wait for your transmitter to key up—the same information you have to provide any TNC before operation. The default information will work for most users, needing only the correct callsign entered. This can be done with any ASCII text editor. The software supplied on the disk contains a program to build your configuration file automatically.

PMP is simple to use. Just hook up the cables to your radio, and plug the interface into your computer's parallel port. Hook up to the serial port for power if you aren't using a 9-volt battery (only for the laptop interface version). Insert your PMP disk and type PMP at the prompt. Hit enter after you see the opening screen and you're ready to go! Andy has simplified a lot of the commands to be single keystrokes. For instance Alt-C commands a connect, Alt-D a disconnect and Alt-H displays the help screen. Hit Alt-L to start capturing a text file. Hit Alt-L again whenever you want to close the capture file. See Table 2 for a complete list of commands. ASCII uploads and downloads are possible, and the scrollback buffer is as large as available memory. One operator in our area lets PMP monitor all day long, and simply walks back through the day's packets a screen at a time to view messages flowing in and out of the area BBS.

Table 2. PMP Commands

Alt-C	Connect
Alt-B	Send Beacon
Alt-D	Disconnect
Alt-H	Show the help screen
Alt-J	Copy a snapshot of the current screen data to a file
Alt-L	Download/Capture a text file
Alt-N	Show a list of nodes recently heard
Alt-P	Pause the screen
Alt-S	Show the system status
Alt-U	Upload a text file from disk
Alt-W	Write the scrollback buffer to disk
Alt-X	Exit PMP
F1-F4	User definable macros
Up/Down	Scrollback a line at a time
PgUp/PgDn	Scrollback a page at a time

OVER 45,000 PK-232s SOLD!

The AEA PK-232 multi-mode data controller remains the most widely used radio data controller in the world. More hams own the PK-232 than *any other* radio data controller, and AEA's hard-earned reputation for quality and service keeps them coming back. The '232 gained its popularity with features like these:

STATE-OF-THE-ART TECHNOLOGY

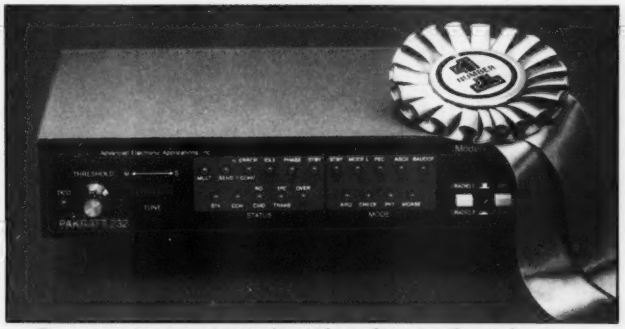
Since its introduction in 1986, the PK-232 has been updated **six times** to continue bringing you the breakthroughs. Six updates in four years! And even the very first PK-232 is upgradable to the latest model, with a relatively inexpensive user-installed kit. If you want a state-of-the-art multi-mode controller, you want the PK-232 MBX.

SUPERIOR FILTERING

The 8-pole Chebyshev filter in the PK-232 was designed from the ground up to work on HF **and** VHF. We didn't just add some firmware to a Packet modem to create our multi-mode. Our modem was **proven** superior by tests in Packet Radio Magazine over *all the others tested.* Read the fine print! You just can't beat the PK-232 for performance, quality and integrity. 45,000 PK-232 owners can't be wrong!

INNOVATION

The PK-232 has been the one to follow for technology advances. It was the *first* radio data controller with weather-fax, the *first* with Host mode, the *first* with NAVTEX, the *first* with Signal Identification, the *first* with TDM, the *first* with AMTOR v.625, the *first* with a WHYNOT command, etc, etc. AEA has always strived to "Bring You The Breakthrough," and while others have tried to imitate, only one can be the best.



The only data controller **designed from the ground up** to be a true multi-mode, the PK-232's tuning and status indicators work in all modes, not just packet. Make sure the multi-mode you buy isn't just a converted Packet TNC. There's only one number 1!

HOST MODE

Many superior programs have been written specifically for the PK-232 in Host mode language: NEW PC-Pakratt II for IBMs and compatibles, updated MacRATT for Apple MacIntosh, and Com-Pakratt or Commodore C-64 and C-128 computers.

ALL DIGITAL OPERATING MODES

The PK-232 MBX includes all authorized amateur digital modes available today...Packet, Baudot, ASCII, AMTOR/SITOR (including the new 625 recommendation) and Morse code, as well as WEFAX (receive and transmit). Other features include the PakMail 18K byte maildrop system with automatic normal and reverse forwarding, NAVTEX/AMTEX reception, KISS protocol support, binary file transfer and more. Also included is the TDM (Time Division Multiplex) mode for SWLing that few others have. No other multi-mode has all these features.

SIGNAL ANALYSIS

The first multi-mode to offer SIAM (Signal Identification and Acquisition Mode) was, of course, the PK-232MBX. Indispensible to SWLers, SIAM automatically identifies Baudot, ASCII, AMTOR/SITOR (ARQ and FEC) and TDM signals, then measures baud rate and polarity. Once the PK-232MBX is "locked on" to the signal, a simple "OK" command switches to the recognized mode and starts the data display. You're even ready to transmit in that mode if applicable.
The PK-232MBX makes SWLing easy and fun, not difficult and frustrating.

REPUTATION

The PK-232MBX has helped AEA establish its hard-earned reputation for producing high quality amateur radio products. Anyone can **say** they have a good reputation, so it pays to ask around. Listen on the HF bands and see which multi-mode is getting *used*. You owe it to yourself to get the best possible value for your money. Don't settle for less!

Watch for the DSP-1232 and 2232 coming soon!

AEA Brings You a Better Experience.

Advanced Electronic Applications, Inc.

2006-196th St. S.W./P.O. Box C2160 Lynnwood, WA 98036 (206)775-7373.

Prices and specifications subject to change without notice or obligation.

© Copyright 1990 by AEA, Inc. All Rights Reserved.

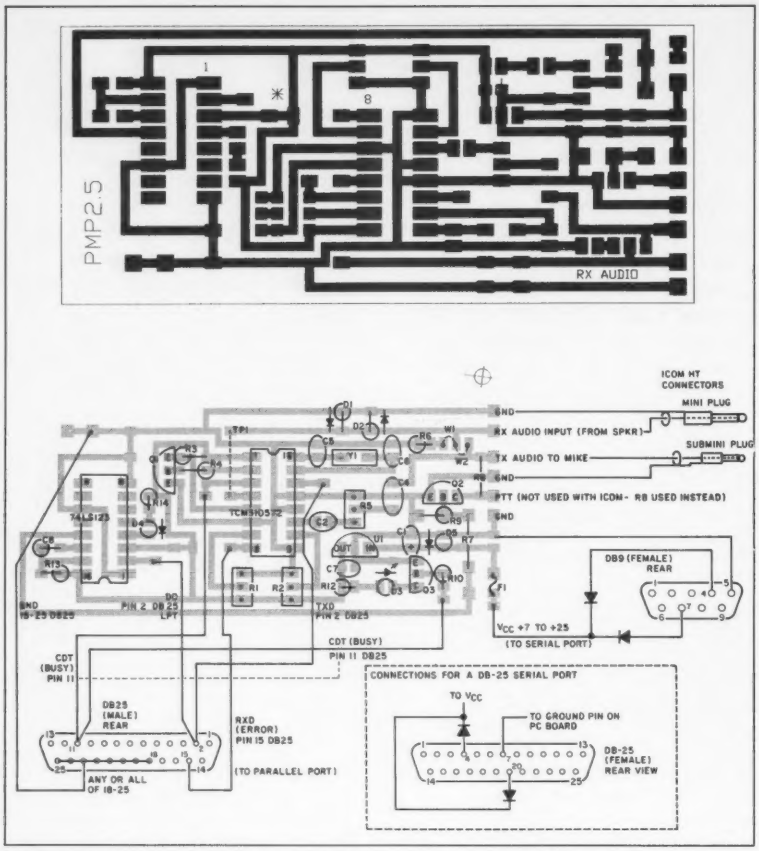


Figure 3. (a) PC board foil pattern for the home station interface with watchdog timer circuit. (b) Parts placement.

Possible Problems

Because of its simplicity, PMP is not quite as foolproof as a full-featured TNC. One potential problem area would be a slow squelch on a radio. Since PMP does not use a DCD (Data Carrier Detect) circuit, it depends on the squelch in conjunction with the CDT line from the modem to tell it when a packet starts and ends. A slow squelch opening may clip the packet header with the callsign information off, rendering the packet unusable. A slow closing squelch is less of a problem because the software can tell by the ending flags where the packet terminated, but the computer remains frozen from responding to the keyboard or displaying the packet until the squelch closes and the CDT line goes low again. The rule of thumb is to put the squelch close to the threshold of opening to help the speed.

The second potential problem is related—performance on a very busy channel. Because of the simplicity of the hardware, the software is very heavily tasked during receive periods, literally timing and counting the bit flips from the modem. Allowing a keyboard interrupt or other distraction during this period would cause the system to lose track of the packet it was in the process of receiving, so all the interrupts are masked off when CDT is high.

On a very busy channel, CDT will go high with each packet heard, and if there is near continuous traffic this can effectively lock the user out of the keyboard! (This will also happen if the radio becomes unsquelched accidentally, or if the modem falls off the parallel port, allowing the CDT pin to float HIGH.) In urban areas it can make things difficult. The only solution is to wait until the channel activity calms down, or pick a less busy frequency.

PMP has been checked out on a fair sample of IBM PCs and compatibles. It does require pretty good compatibility with the IBM standard. Some problems have been reported with machines that have known IBM compatibility problems, such as the ATT PC6300. A partial list of machines it is known to work on includes an IBM PC/XT, Toshiba T1000, Leading Edge Model D, Tandy 1100FD, WYSE PC286, and various 286 and 386 machines using Award BIOS. It even runs in a window under Desqview on my 386 machine.

Enhancing PMP

Figure 1 shows the schematic for the simplest version (the laptop interface) of the modem (the circuit above the dotted line), designed to be hung on the back of a laptop. However, there are a few enhancements below the dotted line that might be of interest (the home station interface).

The radio PTT line is keyed by a signal from the software via the D1 data line on the parallel port; but D1 is only under control when PMP is actually running. If you want to leave the modem and radio connected at all times, you may find that D1 is turned on by other programs, or following a reboot, which inadvertantly keys the transmitter. At times, you may also wish to leave the computer unattended, perhaps to monitor traffic on a channel. An accidental reboot from a power loss could leave D1 in an unknown state and the transmitter keyed.

To address this, U3 was added to form a time-out timer. U3 is a 74LS123 one-shot multivibrator with edge-triggered inputs, whose output circuit is used to drive Q2 instead of letting PMP control it directly. The output of the one-shot stays LOW until pin 2 goes HIGH, then it raises its Q output, turning on transistor Q2. The output only stays HIGH for about 10 milliseconds, unless pin 2 goes LOW and then HIGH again. Pin 2 is connected to the tranmit data from the PMP program. When PMP is running and sending data to be transmitted, the data line connected to pin 2 is toggling at about a 600 Hz rate. Each transition resets the time-out on the one-shot, keeping its output HIGH and the transmitter continuously keyed as long as data is being sent. When the flow of data stops, pin 2 stops changing state, and the one-shot times out 10 milliseconds later, unkeying the transmitter.

If the program locks up, or the computer resets, or if another program is being run, D1 will likely sit at either a one or a zero, but it probably won't be toggling at 600 Hz. So, the transmitter will only burp for 10 milliseconds if D1 goes HIGH, and then it will stay off. D4 and R14 use the /Q output of the one-shot to provide an optional keying indicator.

The circuitry associated with Q3 and D3 also provides for a receive LED. The base of Q3 is tied to the Carrier Detect (CDT) line of the modem chip, and when it goes HIGH indicating received audio, Q3 turns on, causing D3 to light. I use a green LED for D3, and a red LED for D4.

For portable operation, the bare bones modem has a low enough current drain that you may be able to steal enough power from your computer's serial port to run it (or use a 9-volt battery). The PMP configuration file has provisions that allow you to command the handshake lines of the serial port to a desired state. In my case, I command both the hardware handshake lines HIGH and OR them through a pair of diodes to provide about 7 volts at 12 mA, just enough to give me 5 volts out of the regulator. The voltage and current available from the CTS and DTR lines varies from machine to machine, but if you can do it, it reduces the entire packet setup to a computer, a cable and a radio. I have not seen anything simpler for portable packet! Because it is so simple to drag around compared to other packet systems, I find myself running packet from all kinds of locations—the park at lunchtime, a weekend campsite, or even the laundromat!

Poor Man's Packet has achieved both of the goals we set out to accomplish. Andy now has an inexpensive system to allow him to join local packet operations, and I have an easy-to-use packet system for portable operation.

Contact F. Kevin Feeney WB2EMS at 468 Hines Road, Newfield NY 14867. Please enclose an SASE. You can also reach him at kfeeney@helios.tn.cornell.edu. You may reach Andy Payne N8KEI, the software designer, at payne@theory.tc.cornell.edu.

FLYWEIGHT BODY
with HEAVYWEIGHT FEATURES

Alinco's New DJ-F1/F4T Realized Super Compact Body and Plenty of Features including:

***40 Memory Channels** store Frequency, Shift direction, Split operation Setting, Tone encoder/Tone decoder setting (with optional Tone squelch unit), DSQ setting, Tone frequency and Offset frequency independently.

***Digital Signal Display and Memory Function**
The DJ-F1T/F4T has special memory channels for transmitting, receiving, and store "Two Digit" DTMF Tones, for communication messages. This feature allows for the DJ-F1T/F4T to receive a "Two Digit" message and display it at any later time, at the convenience of the operator.

***Wide Band Receiving range**
F1T:140-170MHz(AM Mode 118-136MHz after modification)
F4T:430-460MHz

***Battery Pack Lock**
***Pager and Code Squelch**
***Triple Stage Selective Power Output**
***5W Output Power with Optional Battery Pack EBP-18N**
***8 Scan Modes**
***Programmable VFO Range Function**
***Battery Save Function**
***Six Channel Steps - 5, 10, 12.5, 15, 20, and 25KHz**
***Priority Function (Dual Watch)**
***Automatic Power Off** (Programmable Timed)
***Automatic Dialer Function**
***Illuminated DTMF Keypad**
***Many Optional Accessories such as:**
EMS-8:Remote Control Speaker/Mic.
EME-11:Earphone/Mic. with PTT/VOX
EME-10:Headset with PTT/VOX
EJ-2U:Tone squelch Unit
EDC-33:Quick Charger (Compatible with standard battery pack)

and many more. . . . .

DJ-F1T

DJ-S4T

DJ-S1T/S4T is Simple Type and Low-Priced But Offers Features such as:
***5W Output Power with Optional Battery Pack EBP-18N**
***Triple Stage Slective Power Output**
***Dry Cell Battery Case Lock**
***Programmable VFO Range Function**
***Frequency Lock, PTT Lock Function**
***One Touch Squelch De-Activation Function**
***8 Scan Modes**
***Wide Band Receiving Range**

Available Features with Optional DTMF Unit (DJ-10U) and DTMF Keypad (ESK-1) Include:
***Pager and Code Squelch**
***Digital Signal Display and Memory Function**
***Automatic dialer Function**
***Many Optional Accessories Available**

•Specifications
Frequency Range:
DJ-F1T/S1T
TX:144-148MHz
RX:140-170MHz (AM Mode 118-136MHz after Modification)
DJ-F4T/S4T
TX:440-450MHz
RX:430-460MHz
Output Power:
* with Battery Pack EBP-16N (Standard for F1T/F4T)
Hi:2W(F1T/S1T) 1.5W(F4T/S4T)
Mid:1W Low:0.1W
* with Optional Battery Pack EBP-18N
Hi:5W Mid:1W Low:0.1W
* at 9V
Hi:2.5W(F1T/S1T) 2W(F4T/S4T)
Mid:1W Low:0.1W
Weight:
DJ-F1T/F4T Approx.:13.2 oz.: with Standard Battery Pack
DJ-S1T/S4T Approx.:13 oz.: with Dry Battery case
Dimensions:
4.3(H) × 2.1(W) × 1.5(D) inch (Without Projections)

Specifications and features are guaranteed for amateur bands only and subject to change without notice.

ALINCO ELECTRONICS INC.
438 AMAPOLA AVE. LOT 130
TORRANCE, CALIFORNIA 90501
Phone: 213-618-8616
FAX : 213-618-8758

STAY TUNED with
ALINCO

CIRCLE 67 ON READER SERVICE CARD

here is the next generation Repeater

MARK 4CR

The only repeaters and controllers with REAL SPEECH!

No other repeaters or controllers match Mark 4 in capability and features. That's why Mark 4 is the performance leader at amateur and commercial repeater sites around the world. Only Mark 4 gives you Message Master™ real speech • voice readout of received signal strength, deviation, and frequency error • 4-channel receiver voting • clock time announcements and function control • 7-helical filter receiver • extensive phone patch functions. Unlike others, Mark 4 even includes power supply and a handsome cabinet.

Call or write for specifications on the repeater, controller, and receiver winners.

Create messages just by talking. Speak any phrases or words in any languages or dialect and *your own voice* is stored instantly in solid-state memory. Perfect for emergency warnings, club news bulletins, and DX alerts. Create unique ID and tail messages, and the ultimate in a real speech user mailbox — only with a Mark 4.

Phone: #(508) 372-3442
FAX: #(508) 373-7304

MICRO CONTROL SPECIALTIES

Division of Kendecom Inc.
23 Elm Park, Groveland, MA 01834

2 meters 220 440

CIRCLE 144 ON READER SERVICE CARD

Michigan Radio

SALES *SERVICE*

15000 E. 9 MILE RD. EAST DETROIT, MI 48021

ORDERS	**1-800-TRU-HAMM**
IN-STATE	**1-313-771-4711**
SERVICE	**1-313-771-4712**
FAX SERVICE	**1-313-771-6546**

WANTED: QUALITY USED GEAR, CASH OR TRADE

VISA · MasterCard · AMERICAN EXPRESS

TERMS:
Prices Do Not Include Shipping.
Price and Availability Subject to Change Without Notice
Most Orders Shipped The Same Day
COD's Welcome ($4.00 + shipping)

KENWOOD

HT'S MODEL	DESCRIPTION	LIST	OURS
TH-205A	2M 2.5W AFFORDABLE	314.95	269.95
TH-225A	2M 5W SCANNG DEL	399.95	339.95
TH-28AT	2M 2-5W MINI 15MEM	369.95	314.95
TH-27A	2M 2-5W MICRO 40ME	419.95	354.95
TH-47A	70CM 2-5W MICRO	429.95	359.95
TH-415	70CM 2W SCANNG DEL	419.95	359.95
TH-77A	2M/70CM DEL DUAL B	599.95	•499.95

MOBILE VHF/UHF MODEL	DESCRIPTION	LIST	OURS
TM-241A	2M 45W PROG MIC	469.95	•349.95
TM-2530A	2M 25W DELUXE	499.95	429.95
TM-2550A	2M 45W DELUXE	519.95	449.95
TM-331A	220MHZ 25W PROG MIC	469.95	399.95
TM-441A	440MHZ 25W PROG MIC	479.95	404.95
TM-631A	2M/220MHZ DUAL BAND	749.95	634.95
TM-731A	2M/440MHZ DUAL BAND	749.95	629.95
TM-941	2M/440M/1.2 TRI-BAN	1199.95	1014.95
TM-751A	2M 25W ALL-MODE	699.95	599.95
TM-851A	70CM 25W ALL-MODE	771.95	654.95
TS-711A	2M 25W ALLMODE BASE	1059.95	894.95
TS-790A	2M/70CM SATELLITE	1999.95	1694.95

HF EQUIPMENT MODEL	DESCRIPTION	LIST	OURS
TS-140S	HF COMP GEN COV	949.95	799.95
TS-680S	HF/6M COMP GEN COV	1149.95	990.00
TS-440S	HF DELUXE COMP	1249.95	1060.00
TS-440/AT	HFDEL COMP TUNR	1449.95	1219.95
TS-850S	HF 12V DEL DDS	1699.95	1439.95
TS-850/AT	HF 12V DEL TUNR	1899.95	1619.95
TS-950S	HF BASIC VERSION	3299.95	2794.95
TS-950SD	HF THE DX MACHINE!	4399.95	3724.95

WE STOCK A FULL LINE OF ACCESSORIES
FOR THE KENWOOD LINES. CALL FOR OUR DISCOUNTED PRICES!
1-800-TRU-HAMS

ICOM

HT'S MODEL	DESCRIPTION	LIST	OURS!
IC-02AT	2M 5W 10MEM DTMF	409.00	349.95
IC-2GAT	2M 7W 15MEM DTMF	429.00	389.95
IC-2SAT	2M 2-5W DEL MICRO	439.00	309.95
IC-24AT	2M/70CM DEL MICRO	499.95	519.95
IC-32AT	2M/70CM 6W 20MEM	629.00	549.95
IC-3SAT	220M 2-5W MICRO	449.00	369.95
IC-4SAT	70CM 2-5W MICRO	449.00	379.95
IC-4GAT	70CM 7W 15MEM DTMF	449.00	385.00

MOBILE VHF/UHF MODEL	DESCRIPTION	LIST	OURS!
IC-229A	2M FM, 25W 20MEM	449.00	409.95
IC-229H	2M FM, 45W 20MEM	479.00	439.95
IC-3220A	2M/70CM 25W 40MEM	659.00	599.95
IC-3220H	2M/70CM 45W 40MEM	699.00	629.95
IC-2400	2M/70CM 45W DEL.	869.00	684.95

HF EQUIPMENT MODEL	DESCRIPTION	LIST	OURS!
IC-725	HF COMPACT GEN COV	949.00	799.95
IC-726	HF/6M COMP GEN COV	1299.00	1069.95
IC-735	HF DELUXE COMPACT	1149.00	949.95
IC-751A	HF 12V BASE TXCR	1699.00	1434.95
IC-765	HF DELUXE TNR,PS	3149.00	2699.00
IC-781	HF DX'ERS DELIGHT	6149.00	CALL

WE STOCK A FULL LINE OF ACCESSORIES
FOR THE ICOM LINES. CALL FOR OUR DISCOUNTED PRICES!
1-800-TRU-HAMS

YAESU

HT'S MODEL	DESCRIPTION	LIST	OURS
FT-411E	2M 2-5W 50MEM,CTCSS	409.00	319.95
FT-811	70CM 2-5W 50MEM	405.00	319.95
FT-470	2M/70CM 2-5W 50MEM	491.00	394.95

MOBILE VHF/UHF MODEL	DESCRIPTION	LIST	OURS
FT-212RH	2M 50W,CTCS,DTMF	405.00	349.95
FT-290RII	2M 25W ALL-MODE	610.00	524.95
FT-4700RH	2M/70CM REMOTE HEAD	799.00	689.95
FT-712RHT	70CM 35W, CTCS,DTMF	497.00	424.95
FT-736R	2M/70CM 220/1.2 SAT	1922.00	1599.95
FT-5200	2M/70CM DUAL BAND	749.00	639.95
FT-6200	70CM/1.2 DUAL BAND	899.00	759.95
FT-2400H	2M 50W,LCD,CTCSS	419.00	354.95

HF EQUIPMENT MODEL	DESCRIPTION	LIST	OURS
FT-747GX	HF LGTWGT MOBILE	899.00	699.95
FT757GXII	HF COMP GEN COV	1089.00	929.95
FT-767GX	HF 2//220//70C TUNR	2299.00	1789.95
FT-990	HF 12V DEL TUNR+	2399.00	2034.95
FT-1000B	HF BASIC VERSION	3399.00	2879.95
FT-1000D	HF QSL CATCHER!!	4399.00	3434.95

WE STOCK A FULL LINE OF ACCESSORIES
FOR THE YAESU LINES. CALL FOR OUR DISCOUNTED PRICES! 1-800-TRU-HAMS

TEN-TEC

HF EQUIPMENT—AMERICAN MADE MODEL	DESCRIPTION	LIST	OURS
OMNI IV	HF 9 BAND TXCVR	2245.00	1894.95
PARAGON	HF GEN COV TXCVR	2245.00	1894.95

CIRCLE 162 ON READER SERVICE CARD

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 1254 BOULDER CO

POSTAGE WILL BE PAID BY ADDRESSEE

73 Amateur Radio Today
P.O. BOX 50330
BOULDER CO 80321-0330

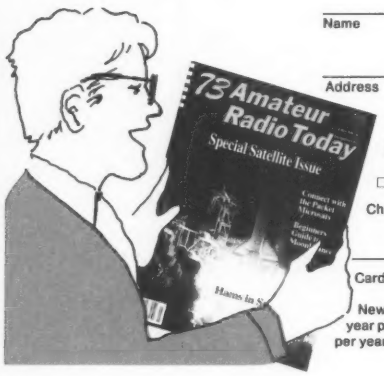
Place
Stamp
Here

73 Amateur Radio Today
EDITORIAL OFFICE
FOREST ROAD, PO BOX 278
HANCOCK NH 03449-0278

SUBSCRIBE and SAVE

with *73 Amateur Radio Today*

☐YES! I want to grow with *73*. Send me 1 year (12 issues in all) of *73* for the low price of $19.97 (Save over $15.00 off the cover price). Mail this postage paid card today or for instant service call toll free 800-289-0388. (In Colorado, call 303-447-9330).



Name (please print) Call

Address

City State Zip

☐Payment enclosed ☐Bill me

Charge my: ☐MC ☐Visa ☐Amex

Card Number Exp. Date

Newsstand rate $35.40. Basic subscription rate $24.97 (Canadian orders add $7.00 per year plus $1.40 GST; other foreign countries add $19.00 per year for surface mail, $42.00 per year for airmail. Please allow 4–6 weeks for delivery of the first issue. 4AK28

FEEDBACK

The Pitch: *73* wants to know what you want to read. Help us by voting on this month's features and columns—you'll find their numbers in the Feedback box on the page preceding this card.

The Payoff: Each month we'll draw a card at random. If yours is picked, you'll receive a one-year subscription (or extension) to *73*.

Article #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Great																									
OK																									
No Way																									

Article #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Great																									
OK																									
No Way																									

I'd like to see more _____

_____

I'd like to see less _____

_____

Name (Please Print) Call

Address

City State Zip

☐ **Please enter my one year subscription to *73* for the low price of $19.97 (Save 43% off the newsstand price). Mail this form or call toll free 1-800-289-0388. (In Colorado, call 303-447-9330)**

☐Payment enclosed ☐Bill me Charge my: ☐MC ☐VISA ☐AMEX

Card Number Exp. Date

Canada add $7.00 plus $1.40 GST; Foreign add $19.00 surface, $42.00 airmail. 4ALR2

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback# Title

1 Letters
2 Never Say Die
3 QRX
4 Poor Man's Packet
5 Review: Kantronics KTU
6 Low Cost Discone Antenna
7 High Speed Data Acquisition
8 Software for the Hamshack, Part IV
9 Review: TAPR Metcon-1
10 Universal CAT Interface
11 Review: Pkt-GOLD
12 Dealer Directory
13 QRP
14 Hams with Class
15 Hamsats
16 DX
17 Barter 'n' Buy
18 Above & Beyond
19 Updates
20 Special Events
21 RTTY Loop
22 New Products
23 Ask Kaboom
24 Homing In
25 ATV
26 Random Output
27 Propagation
28 73 International
29 Hope for Monolingual Hams

G5RV All-Band QuickKits™

Fast & Easy to Build
- Failsafe visual instructions
- No measuring or cutting
- Everything included
- Finish antenna in minutes

Quality Components
- Presoldered Coax Fittings
- Kinkproof QuieFlex wire
- Fully insulated, wx sealed, no-corrode, low noise design

Fastest Antennas in the West
AntennasWest
(801) 373-8425

Double Size G5RV 204 ft 160-10 Dipole	$59.95
Full Size G5RV 102 ft 80-10 Dipole	$34.95
Half Size G5RV 51 ft 40-10 Dipole	$24.95
Quarter Size G5RV 26 ft 20-10 Dipole	$19.95
Marconi Adapter kit converts any dipole to Marconi	$ 4.95
200' Dacron 250# line	$11.95
Add $5 Post & Handling	Info $1

Box 50062-S, Provo, UT 84605

CIRCLE 107 ON READER SERVICE CARD

CB-TO-10 METERS

We specialize in CB radio modification plans and hardware. Frequency and FM conversion kits, repair books, plans, high-performance accessories. Thousands of satisfied customers since 1976! Catalog $2.

CBC INTERNATIONAL
LOU FRANKLIN/K6NH - Owner
P.O. BOX 31500X, PHOENIX, AZ 85046

CABLE T.V. CONVERTERS

Jerrold™, Oak, Scientific Atlantic, Zenith, & many others. "New" MTS stereo add-on: mute & volume. Ideal for 400 & 450 owners.

1–800–826–7623

B & B INC.
4030 Beau-D-Rue Drive, Eagan MN 55122

CIRCLE 21 ON READER SERVICE CARD

HamCall / CD-ROM

500,000 HAMS plus
1,000's of Public Domain
Amateur Radio Programs and Data

CD-ROM Disc	$50.00
Questar Retrieval Software	$50.00
Shipping (per order)	$5.00
Philips CDD200	$399.00
Philips CDD401	$499.00

BUCKMASTER Publishing
Rt. 3, Box 56 - Mineral, Virginia 23117
703-894-5777 - 800-282-5628

CIRCLE 56 ON READER SERVICE CARD

This is not a TNC

This device gathers weather data at your station and makes it available to others via an external TNC and a Local Packet Network. Members of the Packet LAN can simply ask for tables of temperature, wind direction or wind speed. The Kantronics Weathernode then provides this data with the convenience of a mailbox and with the speed of the most advanced technology available.

Included with the KTU Weathernode is a custom EPROM which provides temperature sensing, and with the weathervane and rain guage options,can supply wind speed, direction and rainfall data.

The KTU is easily adapted to multi-site installations and may be remotely accessed with password protection and programmed by the sysop to your network's requirements.

The Kantronics KTU, the first to provide remote weather data to a Packet LAN.

Kantronics 1202 E. 23rd St., Lawrence, KS 66046
913.842.7745 TELCO BBS 913.842.4678

ACE COMMUNICATIONS

AOR Scanners.

Great Performance. Great Service. Great Value.

Free Freight
25-Day Money-Back Guarantee
Toll-Free Service and Support
No Credit Card Surcharge
One Year Warranty

AR1000 $499

1000 Channels. 8-600MHz, 805-1300MHz

Standard Features:

- Extremely compact size.
- Continuous coverage (except UHF TV 600-805)
- Antenna attenuator switch, 10db.
- Manual tuning knob.
- Earphone jack, 3.5mm.
- AM, FM and wide band FM tuning modes.
- Backlighted LCD display.
- 10 Scan Banks, 10 Search Banks.
- Selectable Priority Channel.
- Delay, Hold Features.
- Selectable Search Increments, 5-955KHz.
- Permanent memory backup.
- 4 AA Ni Cad batteries included.
- AC adaptor/charger.
- Carry Case.
- Cigarette Lighter Charger.
- Belt Clip.
- Earphone.

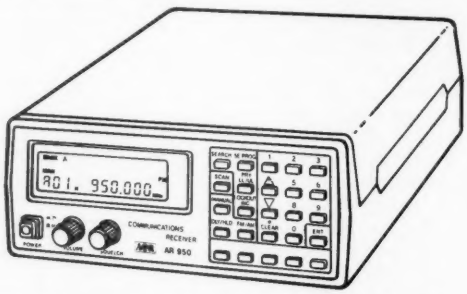
Options:

External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs		$45/$55

Specifications:

Coverage:	8-600, 805,1300MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM
Speed:	20 ch/sec. scan. 40 ch/sec. search
IF:	561.225, 58.075, 455KHz or 10.7MHz
Increments:	5 to 955KHz selectable/ 5 or 12.5 steps.
Audio:	.4 Watts
Power:	Input 9 - 13.8 V. DC
Antenna:	BNC
Display:	LCD
Dimensions:	6 7/8H x 1 3/4D x 2 1/2W. 12oz wt.

AR950 $239



100 Channels. Low, Air, High, UHF & 800MHz.

Standard Features:

- Extremely compact size.
- Unrestricted 800MHz coverage.
- 100 channels permanent memory.
- Earphone Jack & Attenuator.
- Delay, Hold features.
- Channel 1 Priority.
- 5 Scan Banks, 5 Search Banks.
- Telescopic and Flexible Antennas w/ BNC connector.
- AC & DC Power cords w/ mtng hardware.
- One Year Limited Warranty.

Options:

Base type antenna 25 to 1000MHz w 50'coax.	AS300	$59.95
Mag Mnt Mobile Antenna. 15' coax.	MA100	$25.00
Cigarette Lighter power adaptor.	CP100	$4.00
External Speaker with mobile mount.	MS100	$19.50
Extended Warranty. 2/3 yrs		$40/$55

Specifications:

Coverage:	27-54, 108-174, 406-512, 830-950MHz
Sensitivity:	.4uV Lo,Hi. .8uV Air. .5uV UHF. 1.0uV 800
Scan Speed:	15 ch/sec.
IF:	21.4MHz, 455KHz
Increments:	10,12.5,25,30
Audio:	1W
Power:	12.8VDC, 200MA
Antenna:	BNC
Display:	LCD w/backlight
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D. 14oz wt.

We offer 100's of communications products.

CIRCLE 164 ON READER SERVICE CARD

ACE
COMMUNICATIONS

AR2500 $499

2016 Channels. 1 MHz to 1500 MHz

Standard Features

- Continuous coverage
- AM, FM, wide band FM, & BFO for SSB, CW.
- 64 Scan Banks.
- 16 Search Banks.
- RS232 port built in.
- Includes AC/DC pwr crd. Antenna, Mntng Brckt.
- One Year Limited Warranty.

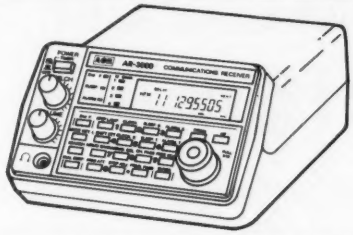
Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS2	$295.00

Specifications:

Coverage:	1 MHz - 1500MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	38 ch/sec. scan. 38 ch/sec. search
IF:	750.00, 45.0275, 5.5MHz 455KHz
Increments:	5,12,5,25 KHz
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 300mA
Antenna:	BNC
Display:	LCD, backlighted.
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D Wt. 1lb.

AR3000 $995



400 Channels. 100KHz to 2036MHz.

Standard Features:

- Extremely compact size.
- Continuous coverage
- Attenuation Programmable by Channel.
- Manual tuning knob.
- Tuning increments down to 50Hz.
- AM, FM, wide band FM, LSB, USB, CW modes.
- Backlighted LCD display.
- 4 Scan and Search Banks, Lockout in Search.
- 4 Priority Channels.
- RS232 control through DB25 connector.
- Delay, Hold Features.
- 15 band pass filters, GaAsFET RF amp.
- Sleep and Alarm Features.
- AC adaptor/charger. DC power cord.
- Telescopic Antenna.

Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS3	$295.00

Specifications:

Coverage:	100KHz - 2036MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	20 ch/sec. scan. 20ch/sec. search
IF:	736.23, (352.23) (198.63) 45.0275, 455KHz
Increments:	50Hz and greater
Selectivity:	2.4Khz/-6db (SSB) 12KHz/-6db (NFM/AM)
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 500mA
Antenna:	BNC
Display:	LCD
Dimensions:	3 1/7H x 5 2/5W x 7 7/8D Wt. 2lb 10oz.

To Order Call 1•800•445•7717

In All 50 States and Canada. 24 Hours a Day. Fax Orders: 1-800-448-1084, 24 Hours a Day.
ACE Communications Monitor Division 10707 E. 106th Street, Fishers, IN 46038
Int'l Voice# 317-842-7115. Int'l Fax# 317-849-8794.
Service and Support Lines: Mon-Fri 9a.m. to 9p.m., Saturday 10-4. EST
MasterCard, Visa, American Express, Checks, Approved P.O.'s. & C.O.D. (add 5.00)
Prices and specifications subject to change.

CIRCLE 164 ON READER SERVICE CARD

73 Review *by Marc Stern WA1R*

Pkt-GOLD Multimode

InterFlex Systems Design Corp.
P.O. Box 6418
Laguna Niguel CA 92607-6418
(714) 496–6639
Price Class: $60

Your software window into the world of digital communications!

I like new software, especially things I can use with my Heathkit HK-232 MBX multimode controller, a PK-232 clone.

Pkt-GOLD Multimode is a program that turned out to be one of the best implementations of multimode controller software that I have seen. In my opinion, the program does a great many things right, or better-than-right, and it all adds up to quite a nice piece of work by the developers at InterFlex Systems.

Installation

For starters, loading and setting up the program on a hard disk is easy. All you do is put the disk into drive A, and type "INSTALL"; the program does the rest. After you answer several questions about such things as baud rate, communications port, video adapter and the like, as well as filling in your call, you are ready to go by typing "PKTGOLD" at the system prompt.

Pkt-GOLD Multimode takes full advantage of AEA's "host" mode—perhaps the most robust implementation of "host" mode on the market. It allows you to keep the memory backup batteries in place during power-up. AEA's own software indicates that you have to pull out the batteries to prevent software hanging up, but Pkt-GOLD Multimode lets you leave the batteries in place. Pkt-GOLD Multimode emulates the PK-232's architecture in software, which makes your PC's RAM look like a multimode controller. To the controller, it doesn't make a bit of difference where it gets its information from, whether the information comes from its own buffers or your PC's RAM. Pkt-GOLD Multimode attempts to retain any text that might be in any of your controller's buffers. If it does not find text, after checking several times in an effort to avoid a RESET command, it then has to load the buffers with program and textual information and this takes time.

I found that InterFlex's advice was well-taken as I tried using my controller both without and with batteries. Without batteries, and if the TNC was turned off, the initialization process took the better part of a minute. With the batteries, the initialization took about five seconds because the controller was set up and ready to go with parameters that I had already entered.

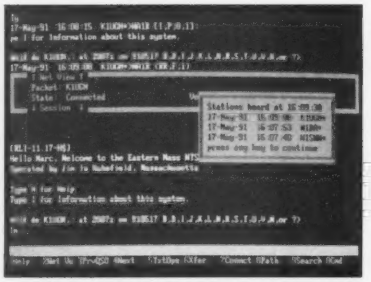


Photo A. While you're connected to another station, Pkt-GOLD's versatile features allow you to monitor all of the channel activity. All activity is displayed at the top of the screen (Net View); your connect session is displayed at the bottom portion (Session). Pop-up screens are available at any time. For example, pressing <ALT> F2 gives you the current MHEARD list.

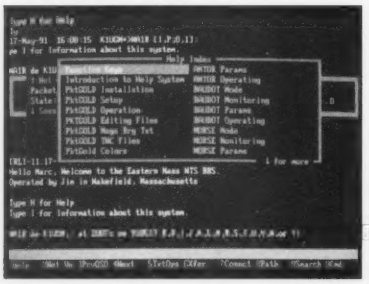


Photo B. The help screen is available at any time as a pop-up menu.

Photo C. Pressing function key F10 allows you to quickly change modes.

The bottom line is to put the batteries back in the TNC. This saves Maildrop messages in case of power loss, and offers some other advantages as well (like not losing your callsign, alias, and other settings if there is a brief power loss, or if you turn off your TNC and turn it back on). With the batteries installed, Pkt-GOLD Multimode zipped through the initialization. A pop-up window displayed the parameters that Pkt-GOLD Multimode was loading into memory from the default ASCII text file, called "Startup.TNC." If the Startup.TNC file is edited to bare bones startup parameters, the initialization is virtually instant.

A Versatile Program

Pkt-GOLD Multimode's development team, Lynn Taylor WB6UUT and Jeff Towle WA4EGT, have put lots of nice things into their software.

For starters, the user interface is clean and intuitive. There's a brief listing of the function keys at the bottom of the screen. The ALT key changes the functionality of those keys. The user interface also offers a split screen that lets you monitor what is going on with sessions other than your own, as well as of your own. It's like having an eye on the frequency you are using, as well as on the station you are trying to contact.

It's easy to see that this software is powerful. For example, when I was using Pkt-GOLD Multimode for multi-connects, I found that when I pressed the CTRL key on my PC, I saw a number of channels indicated at the bottom. In several of those channels I saw the stations that I was trying to contact. When I was multi-connecting, the program latched onto the station with which I was trying to connect and assigned it a specific memory location, or "channel." Also, if you are doing a multi-connect, a few keystrokes will put these stations into one or more conferences, which is great for emergency situations or general round-table discussions.

Pkt-GOLD Multimode is loaded with utilities. I found that not only could I log onto my favorite bulletin board and my home BBS, but I could also log onto other stations at the same time. All I did was type in the callsign of the station I wanted to connect to, hit the F7 func-

COMMUNICATIONS ELECTRONICS INC.

Emergency Operations Center has expanded to our new two acre facility and World Headquarters. Because of our growth, CEI is now your *one stop source* for emergency response equipment. When you have a command, control or communications need, essential emergency supplies can be rushed to you by CEI. As always, for over twenty two years, we're ready, willing and able to help.

Our RELM two-way radio transceivers were especially created for government agencies. When you need to talk to police, fire, ambulance, or state, federal and international response forces, RELM transceivers may be quickly programmed for up to 48 frequencies. Listed below, are some of our most asked about transceivers. For additional assistance, call CEI at 313-996-8888.

NEW! RELM® RSP500-A

List price $465.00/**CE price $319.95/SPECIAL**
20 Channel • 5 Watt • Handheld Transceiver
Frequency range: 148-174 MHz. continuous coverage. Will also work 134-148 MHz. with reduced performance.
The *RELM* RSP500B-A is our most popular programmable 5 watt, 20 channel handheld transceiver. You can scan 20 channels at up to 40 channels per second. It includes CTCSS tone and digital coded squelch. Snap on batteries give you plenty of power. Additional features such as time-out timer, busy-channel lockout, cloning, plug-in programming and IBM PC compatability are standard. It is F.C.C. type accepted for data transmission and D.O.C. approved. We recommend also ordering the **BC45** rapid charge 1½ hour desk battery charger for $99.95, a deluxe leather case **LC45** for $48.95 and an external speaker microphone with clip **SM45** for $59.95. Since this radio is programmed with an external programmer, be sure to also order one **PM45** at $74.95 for your radio system.

NEW! RELM® UC102/UC202

List price $128.33/**CE price $79.95/SPECIAL**
CEI understands that all agencies want excellent communications capability, but most departments are strapped for funds. To help, CEI now offers a special package deal on the RELM UC102 one watt transceiver. You get a UC102 handheld transceiver on 154.5700 MHz., flexible antenna, battery charger and battery pack for only $79.95. If you want even more power, order the RELM **UC202** two watt transceiver for $114.95.

NEW! RELM® RH256NB-A

List price $449.95/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority Time-out timer • Off Hook Priority Channel
The *RELM* RH256NB is the updated version of the popular RELM RH256B sixteen-channel VHF land mobile transceiver. The radio technician maintaining your radio system can store up to 16 frequencies without an external programming tool. All radios come with CTCSS tone and scanning capabilities. This transceiver even has a priority function. Be sure to order one set of programming instructions, part # **PI256N** for $10.00 and a service manual, part # **SMRH256N** for $24.95 for the RH256NB. A 60 Watt VHF 150-162 MHz. version called the **RH606B** is available for $429.95. A UHF 15 watt, 16 channel similar version of this radio called the **LMU15B-A** is also available and covers 450-482 MHz. for only $339.95. An external programming unit **SPM2** for $49.95 is needed for programming the LMU15B UHF transceiver.

NEW! RELM® LMV2548B-A

List price $423.33/**CE price $289.95/SPECIAL**
48 Channel • 25 Watt Transceiver • Priority
RELM's new LMV2548B gives you up to 48 channels which can be organized into 4 separate scan areas for convenient grouping of channels and improved communications efficiency. With an external programmer, your radio technician can reprogram this radio in minutes with the **PM100A** programmer for $99.95 without even opening the transceiver. A similar 16 channel, 60 watt unit called the **RMV60B** is available for $489.95. A low band version called the **RML60A** for 30-43.000 MHz. or the **RML60B** for 37-50.000 MHz. is also available for $489.95.

RELM® Programming Tools

If you are the dealer or radio technician maintaining your own radio system, you **must** order a programming tool to activate various transceivers. The **PCKIT010** for $149.95 is designed to program almost all RELM radios by interconnecting between a MS/DOS PC and the radio. The **PM100A** for $99.95 is designed to externally program the RMV60B, RML60A, RML60B and LMV2548 radios. The **SPM2** for $49.95 is for the LMV25B and LMU15B transceivers. The **RMP1** for $49.95 is for the RMU45B transceiver. *Programmers must be used with caution and only by qualified personnel because incorrect programming can cause severe interference and disruption to operating communications systems.*

★★★ *Uniden CB Radios* ★★★

The *Uniden* line of Citizens Band Radio transceivers is designed to give you emergency communications at a reasonable price. Uniden CB radios are so reliable they have a two year limited warranty.

PRO310E-A *Uniden* 40 Ch. Portable/Mobile CB . . . $72.95
PRO330E-A *Uniden* 40 Ch. Remote mount CB . . . $99.95
GRANT-A3 *Uniden* 40 channel SSB CB mobile $152.95
WASHINGTON-A *Uniden* 40 ch. SSB CB base . . . $209.95
PC122-A3 *Uniden* 40 channel SSB CB mobile . . . $113.95
PC66A-A *Uniden* 40 channel CB Mobile $78.95
PRO510XL-A3 *Uniden* 40 channel CB Mobile $34.95
PRO520XL-A3 *Uniden* 40 channel CB Mobile $49.95
PRO535E-A *Uniden* 40 channel CB Mobile. $73.95
PRO538W-A *Uniden* 40 ch. weather CB Mobile . . . $78.95
PRO640E-A3 *Uniden* 40 ch. SSB CB mobile $133.95
PRO810E-A *Uniden* 40 channel SSB CB Base . . . $174.95

★★★ *Uniden Radar Detectors* ★★★

Buy the finest *Uniden* radar detectors from CEI today.
CARD-A3 *Uniden* credit card size radar detector. . . $127.95
RD3XL-A3 *Uniden* 3 band radar detector. $124.95
RD9GTL-A *Uniden* "Passport" size radar detector. . . $89.95
RD9XL-A3 *Uniden* "micro" size radar detector . . . $107.95
RD25-A *Uniden* visor mount radar detector. $54.95

Bearcat® 200XLT-A

List price $509.95/**CE price $239.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-A3** for only $179.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-A

List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
Now...nothing excluded in the 806-912 MHz band.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

NEW! Uniden® MR8100-A

Call 313-996-8888 for special CEI pricing
12-Band, 100 Channel • Surveillance scanner
Bands: 29-54, 116-174, 406-512, 806-956 MHz.
The *Uniden* MR8100 surveillance scanner is different from all other scanners. Originally designed for intelligence agencies, fire departments and public safety use, this scanner offers a breakthrough of new and enhanced features. Scan speed is almost 100 channels per second. You get four digit readout past the decimal point. Complete coverage of 800 MHz. band when programmed with a personal computer. Alphanumeric designation of channels, separate speaker, backlit LCD display and more. To activate the many unique features of the Uniden MR8100 a computer interface program is available for $19.95. Due to manufacturers' territorial restrictions, the MR8100 is not available for *direct* shipment from CEI to CA, OR, WA, NV, ID or UT.

NEW! Ranger® RCI2950-A3

List price $549.95/**CE price $259.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Repeater Splits RIT • 10 Programmable Memory Positions
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
The *Ranger* RCI2950 Mobile 10 Meter Transceiver has everything you need for amateur radio communications. The RF power control feature in the RCI2950 allows you to adjust the RF output power continuously from 1 watt through a full 25 watts output on USB, LSB and CW modes. You get a noise blanker, roger beep, PA mode, mike gain, digital VFO, built-in S/RF/MOD/SWR meter. Frequency selections may be made from a switch on the microphone or the front panel. The RCI2950 gives you AM, FM, USB, LSB or CW operation. For technical info, call Ranger at 619-259-0287.

RELM LMV2548B Only $289.95

OTHER RADIOS AND ACCESSORIES

XC365-A *Uniden* Ultra Clear Plus Cordless Phone. . . $89.95
CT785-A *Uniden* speakerphone cordless phone. . . $109.95
BC55XLT-A *Bearcat* 10 channel scanner $114.95
AD100-A Plug in wall charger for BC55XLT. $14.95
PS001-A Cigarette lighter cable for BC55XLT $14.95
VC001-A Carrying case for BC55XLT. $14.95
BC70XLT-A *Bearcat* 20 channel scanner. $159.95
BC142XL-A *Bearcat* 10 ch. 10 band scanner. $84.95
BC147XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BC172XL-A *Bearcat* 20 ch. 11 band scanner. $134.95
BC177XLT-A *Bearcat* 16 ch. 11 band scanner . . . $134.95
BC590XLT-A *Bearcat* 100 ch. 11 band scanner. . . . $194.95
BC760XLT-A *Bearcat* 100 ch. 12 band scanner. . . . $254.95
BC002-A CTCSS tone board for BC590/760XLT $54.95
BC003-A Switch assembly for BC590/760XLT $22.95
BC855XLT-A *Bearcat* 50 ch. 12 band scanner . . . $199.95
BC1-A *Bearcat* Information scanner with CB $129.95
BC330A-A *Bearcat* Information scanner. $99.95
BC560XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BP205-A Ni-Cad batt. pack for BC200/BC100XLT. . . $39.95
TRAVELLER2-A *Grundig* shortwave receiver $89.95
COSMOPOLIT-A *Grundig* shortwave receiver. . . . $199.95
SATELLIT500-A *Grundig* shortwave receiver $679.95
SATELLIT650 *Grundig* shortwave receiver. $949.95
ATS803A-A *Sangean* shortwave receiver. $159.95
74102-A *Midland* emergency weather receiver. . . . $39.95
77116-A *Midland* CB with VHF weather & antenna. . . $66.95
77118-A *Midland* CB mobile with VHF weather. . . . $62.95
77913-A *Midland* CB portable with VHF weather $79.95
76300-A *Midland* CB base station $92.95
FBE-A Frequency Directory for Eastern U.S.A. $14.95
FBW-A Frequency Directory for Western U.S.A. $14.95
RFD1-A MI, IL, IN, KY, OH, WI Frequency Directory . . . $14.95
RFD2-A CT, ME, MA, NH, RI, VT Directory $14.95
RFD3-A DE, DC, MD, NJ, NY, PA, VA, WV Dir. $14.95
RFD4-A AL, AR, FL, GA, LA, MS, NC, PR, SC, TN, VI . . . $14.95
RFD5-A AK, ID, IA, MN, MT, NE, ND, OR, SD, WA, WY . . . $14.95
RFD6-A CA, NV, UT, AZ, HI, GU Freq. Directory. . . . $14.95
RFD7-A CO, KS, MO, NM, OK, TX Freq. Directory $14.95
PWB-A Passport to World Band Radio $16.95
ASD-A Airplane Scanner Directory. $14.95
TSG-G7 "Top Secret" Registry of U.S. Govt. Freq. . . . $16.95
TTC-A Tune in on telephone calls. $14.95
CBH-A Big CB Handbook/AM/FM/Freeband. $14.95
TIC-A Techniques for Intercepting Communications . . . $14.95
RRF-A Railroad frequency directory $14.95
EEC-A Embassy & Espionage Communications. . . . $14.95
SMH-A2 Scanner Modification Handbook, Vol. 2 . . . . $18.95
LIN-A Latest Intelligence by James E. Tunnell. $16.95
A60-A Magnet mount mobile scanner antenna $34.95
A70-A Base station scanner antenna $34.95
USAMM-A Mag mount VHF ant. w/ 12' cable $39.95
USAK-A ¾" hole mount VHF ant. w/ 17' cable $34.95
Add $4.00 shipping for all *accessories* ordered at the same time.
Add $15.00 shipping per radio and $4.00 per antenna.

BUY WITH CONFIDENCE

Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically or equivalent product substituted unless CEI is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. CEI warehouse in Ann Arbor, Michigan. No COD's. Not responsible for typographical errors.

Mail orders to: Communications Electronics," Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $15.00 per radio for U.P.S. *ground* shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are two times continental U.S. rates. If you have a Discover, Visa, American Express or MasterCard, you may call and place a credit card order. 5% surcharge for billing to American Express. For credit card order, call toll-free in the U.S. Dial 800-USA-SCAN. For information call 313-996-8888. FAX anytime, dial 313-663-8888. Order today.

Scanner Distribution Center™ and CEI logos are trademarks of Communications Electronics Inc.
Sale dates 3/15/91 — 10/31/91 AD #032591-A
Copyright © 1991 Communications Electronics Inc.

For more information call

1-313-996-8888

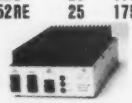
Communications Electronics Inc.
Emergency Operations Center
P.O. Box 1045 □ Ann Arbor, Michigan 48106-1045 U.S.A.
For orders call 313-996-8888 or FAX 313-663-8888

CIRCLE 121 ON READER SERVICE CARD

RF POWER AMPLIFIERS

NEW! 400 WATTS (144-148 MHz)

Model	Pin (W)	Pout (W)	Ic (A)	Gain/NF (dB)	(13.6 V) Type
50 MHz					
0508G	1	170	28	15/0.6	Standard
0508R	1	170	28	–/–	Repeater
0510G	10	170	25	15/0.6	Standard
0510R	10	170	25	–/–	Repeater
0550G	10	400	60	15/0.6	HPA
0550RH	10	400	60	–/–	Repeater HPA
0552G	25-40	400	55	15/0.6	HPA
0552RH	25-40	400	55	–/–	Repeater HPA
144 MHz					
1403G	1-5	10-50	6	15/0.6	LPA
1409G	2	150	25	15/0.6	Standard
1409R	2	150	24	–/–	Repeater
1410G	10	160	25	15/0.6	Standard
1410R	10	160	24	–/–	Repeater
1412G	25-45	160	20	15/0.6	Standard
1412R	25-45	160	19	–/–	Repeater
1450G	10	400	54	15/0.6	HPA
1450RH	10	400	54	–/–	Repeater HPA
1452G	25	400	50	15/0.6	HPA
1452RH	25	400	50	–/–	Repeater HPA
1454G	50-100	400	45	15/0.6	HPA
1454RH	50-100	400	45	–/–	Repeater HPA
220 MHz					
2210G	10	130	20	12/0.7	Standard
2210R	10	130	19	–/–	Repeater
2212G	30	130	16	12/0.7	Standard
2212R	30	130	15	–/–	Repeater
2250G	10	220	42	14/0.7	HPA
2250RH	10	280	45	–/–	Repeater HPA
2252G	25	220	36	14/0.7	HPA
2252RH	25	280	40	–/–	Repeater HPA
440 MHz					
4410G	10	100	19	10/1.1	Standard
4410R	10	100	18	–/–	Repeater
4412G	20-30	100	19	10/1.1	Standard
4412R	20-30	100	18	–/–	Repeater
4450G	10	175	34	12/1.1	HPA
4450RE	10	175	34	–/–	Repeater HPA
4452G	25	175	29	12/1.1	HPA
4452RE	25	175	29	–/–	Repeater HPA



MODEL 1410G

MODEL 1450G

All amplifiers (non-rptr) are linear, all-mode with fully automatic T/R switching and PTT capability. The receive preamps use GaAs FET devices rated at .5 dB NF with +18 dBm 3rd order IP. LPA, Standard and HPA amps are intermittent duty design suitable for base and mobile operation. Repeater amps are continuous duty, class C.

Amplifier capabilities: High-power, narrow or wide-band; 100-200 MHz, 225-400 MHz, 1-2 GHz. Military (28V), Commercial, etc. – consult factory. A complete line of Rx preamps also available.

RX Preamplifiers

Band	Model	NF (dB)	Gain (dB)	Connector
50 MHz	0520B	.5	25	BNC
50 MHz	0520N	.5	25	N
144 MHz	1420B	.5	24	BNC
144 MHz	1420N	.5	24	N
220 MHz	2220B	.5	22	BNC
220 MHz	2220N	.5	22	N
440 MHz	4420B	.5	18	GNC
440 MHz	4420N	.5	18	N

Consult your local dealer or send directly for further product information. All Products Made in USA.

TE SYSTEMS

TE SYSTEMS
P.O. Box 25845
Los Angeles, CA 90025

TEL 213-478-0591
FAX 213-473-4038

CIRCLE 232 ON READER SERVICE CARD

tion key, and then switch sessions with the F4 function key. Each session would alert me if there was mail or traffic waiting with a flashing prompt on the graphics screen. I was then able to personalize things by going back to each session with the F4 function key and, by using ALT-N (name) keys, type in the operator's name which then appeared next to the callsign on each session screen.

Using the "next" key [F4], I was able to cycle through the sessions easily. Note that each session was individual and any text I typed was used only by the particular session I had attached to. Pkt-GOLD Multimode also has "cut and paste" features that allow you to transfer text to another station. For example, I cut text from an AMTOR session, and sent it to the local packet BBS after editing it using the clipboard editor. Also, printing to a printer or file is easy using [Alt-P]. Printing can commence from the beginning of the screen buffer (which can be as much as 300K), or you can just print new text.

The program also supports saving session text on a callsign-by-callsign basis. You tag certain sessions as "important," and every time that station connects, text is saved/appended to a file with the callsign as the file name. These are certainly useful features for emergencies or situations requiring backup documentation.

There is no special screen to go to, but you can enter a full screen parameter editor if you wish. Changing one or a few parameters is done easily by typing the parameter and value, and using the CMD key [F10]. Basically, you use the [Enter] key to send things THROUGH the controller over to the other station, and the [F10] key to send things TO your controller, such as parameter changes or new settings.

Pkt-GOLD Multimode also understands how to use NET/ROM for hopping from node to node. Connecting to a node and requesting a circuit to the next node takes time. Pkt-GOLD Multimode does the waiting and automatically issues the subsequent "connect" requests for you. You just type something like this: CNODE1 | NODE2 | NODE3 | W2ABC and Pkt-GOLD Multimode handles all the interim node connects, getting you to W2ABC. As it progresses through the node system, each successful connect results in a CW message and a pop-up screen telling you of the progress through the node system.

You can also set up "quick connects" with these multi-hop "path" statements and simply hit the [F7] connect key, highlight the target station, such as "W2ABC," and the program does the rest.

An interesting feature of NET/ROM is that you may have multiple connects to a single node by using its node alias. If you connect to the node using the station callsign, NET/ROM allows only a single connect. However, if you connect to a node using its alias (e.g. "GR-BOX" instead of "WA1R-2") NET/ROM will allow up to 15 multiple connects using the "alias-n," where "n" can be up to 15. Pkt-GOLD Multimode understands this, and allows you to use the same set of NET/ROM nodes to establish many sessions. It automatically assigns unique sessions with the entry node by assigning different SSIDs, the number after the "alias" name.

Multiple Features

Perhaps the neatest thing I found is Pkt-GOLD's ability to implement all the modes of the controller.

Pkt-GOLD Multimode takes advantage of the ROM that is already in your controller. With Pkt-GOLD Multimode, you can use the same friendly program features on all of the other modes available. If you have a PK-232, you can use AMTOR, NAVTEX, RTTY, Morse, TDM (Time Domain Multiplexing, a new PK-232 mode in which several signals are able to use one frequency by digitally shifting their timing slightly), packet, and the PK-232's patented SIAM mode. Changing modes is a snap.

Pkt-GOLD Multimode also offers protocol file exchanges for error-free transmission of any file, while allowing keyboard-to-keyboard conversation on the same channel, and of other multiple connects, all at the same time. You can get remote user directories and, while transferring a file, the program shows the remaining time and the effective baud rate of the transmission to other stations requesting files. It also provides file transfer statistics to these other stations, estimating when the file transfer will be finished.

For those with PK-88 controllers, Pkt-GOLD Multimode offers all of the powerful features that it does on the PK-232 (for packet mode). Briefly, some of the other features are "Brag" file support for longer descriptive messages, and [Alt-0..9] keys for one-line messages, both supporting macros such as "?callsign" to fill in the other station's callsign, or "?name" to fill in the remote user name, to make messages appear to be personalized.

Well Worth the Money

To say that I like this program is putting it a little mildly. I tested Pkt-GOLD on my PC clone (EGA monitor, 640K of RAM, 80286 CPU, hard disk). It also supports VGA and other enhanced video display cards. The program runs flawlessly at the highest terminal baud rates of 9600 for the PK-232 and 19200 baud on the PK-88. It has an integrated set-up area, accessed with the [Alt-S] key combination. This is where you enter quick connects, station information, and set many of the program refinements like 25/43/50 line screen mode color settings, size of the NetView screen, pop-up window time, Morse code announcement speed, file paths, and the like.

Pkt-GOLD features pop-up displays and menus galore. The documentation is clearly written and leads you quickly through the features of the program. In addition to the printed book, you get a complete online help system that is context-sensitive and hypertext.

You can learn about operating modes, parameter settings, frequencies, even how to tune up the controller and radio for maximum performance, by perusing this multi-page cross-referenced help system.

Overall, if you are looking for a reliable, solid system, I would say Pkt-GOLD Multimode is more than worth the price, much more than worth it! 73

WE SHIP WORLDWIDE

Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

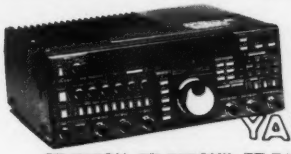
Your one source for all Radio Equipment!

For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en Nueva York
WE SHIP WORLDWIDE!

DEANNA KB2JYL, BIKAR, KITTY WA2BAP, EMIL N2EZZ, JAN KB2RV, LEWIS W2BIE

L. Juli

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday & Sunday 10 to 5 P.M.
Monday-Friday 9 to 6:00 PM
Come to Barry's for the best buys in town



DRSI

ONV Safety belts-in stock

YAESU

FT-767GX, FT-757GXII, FT-747GX, FT-990, FRG-8800, FT-736R, FT-1000D, FT-5200, FT-2400, FT-470

ICOM

IC-R71A, 751A, 781, 229H, R-7000, IC-765, 275A/H, 3220A, 475A/H, 735, IC-901, IC725, IC-2410A/2500A

KENWOOD

ANTENNAS
A-S, AES, Cushcraft, Hy-Gain, Hustler, KLM, METZ, Urban, MODUBLOX, TONNA, Butternut, Multi-Band

TS450S/AT, R-5000, TS-850S, TM 241A/441A, TM-2550A, TR-751A, Kenwood Service Repair, TM-731A, TS-811A, TH225A, TM-631A, TS140S, TS690S, RZ-1, TS-790A, TS950SD, TH-77A, TH27/47A, TM-941A, TM-741A.

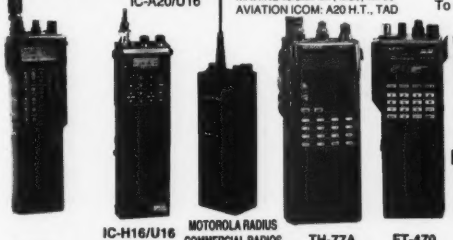
AMPLIFIERS STOCKED:
RF Concepts
Mirage
TE Systems

MARINE RADIOS
ICOM M7, M11, M56, M700TY, M800
AVIATION PORTABLE ICOM A-20
KING KX-99

Budwig ANT. Products
FLUKE 77, 83, 85, 87 Multimeters

YAESU ICOM
FT-23R IC2/3/4SAT
FT411E-811-911 IC02AT/32AT
FTH-2008/7008 IC2/4GAT/24AT
IC-A20/U16

Landmobile HT's
ICOM: U16, H16, V100, U400
MAXON, MOTOROLA,
YAESU: FTH 2008/7008
UNIDEN, REGENCY, KING,
MARINE ICOM: M7, M56, M700
AVIATION ICOM: A20 H.T., TAD



IC-W2A | IC-H16/U16 | MOTOROLA RADIUS COMMERCIAL RADIOS | TH-77A | FT-470

CES
Simplex Autopatch SDI-50 Will Patch FM Transceiver To Your Telephone. Great For Telephone Calls From mobile To Base. Simple To use. SDI-50, SSI-68.

Connect Systems (CSI)
PRIVATE PATCH V, Duplex 8200, CS700

TUNERS STOCKED:
NYE MBV-A 3 Kilowatt Tuner

MFJ-989C

Panasonic
Shortwave Radios/Marine

Kantronics
KAM, KPC II,
KPC IV, Data Engine,
DVR 2.2

Covercraft Coaxseal Stocked

SHORTWAVE RECEIVERS STOCKED

VoCom/Mirage/Alinco
Tokyo Hy-Power/TE SYSTEMS
Amplifiers & 5/8λ HT Gain
Antennas IN STOCK

Computer Interfaces Stocked: MFJ-1270B, MFJ-1274, MFJ-1224, AEA PK-88, MFJ-1278T, PK-232 MBX W/FAX, DRSI PRODUCTS

DAIWA DIGITAL WATT METERS

COMMERCIAL & HAM REPEATERS STOCKED. WRITE FOR QUOTES

MOTOROLA AUTHORIZED DEALER
KACHINA COMMUNICATIONS DEALER

JRC
NRD-525, JST135, NRD-535

G&G ELECTRONICS ART1, Air Disk, SWL, Morse Coach

Professional Soldering Station 48 Watts $79

METRON KW HF Mobile Amplifier Stocked

AOR-AR-1000/900—wide range, hand held scanners

Wide selection of SW & Amateur Publications

AUTHORIZED
SONY
DEALER

DIGITAL FREQUENCY COUNTERS
OPTOELECTRONICS model 1300 H/A, 0-1300MHz 2300, 2210 H, 0-2200 MHz, 2600H, UTC-3000

Long-range Wireless Telephone for export in stock

BENCHER PADDLES, BALUNS, LOW PASS FILTERS IN STOCK

MIRAGE AMPLIFIERS
ASTRON POWER SUPPLIES
Belden Wire & Cable, Int'l Wire
OPTO KEYERS STOCKED

Radios for Business, Gov't, 2-way, etc. Stocked & serviced, call for great prices!

COMET ANTENNAS STOCKED

HEIL EQUIPMENT IN STOCK

Media Mentors—
Amateur Radio Course

New TEN-TEC
PARAGON, OMNI V

Hy-Gain Towers will be shipped direct to you FREE of shipping cost.

IIX Towers, Antennas, Mobile Radio mounts stocked. Call.

Alpha Delta Products Stocked

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
6146B

AEA Isopoles (144, 220, 440 MHz), Isoloop.

BIRD Wattmeters & Elements In Stock

AMERITRON AUTHORIZED DEALER

MAIL ALL ORDERS TO: BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST., BETWEEN SPRING AND BROOME ST.)

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"
BARRY INTERNATIONAL TELEX 12-7670

Monday-Friday 9 A.M to 6:00 P.M.
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)

IRT/LEX-"Spring St. Station". **Subways:** BMT-"Prince St. Station". IND-"F" Train-Bwy Station"
Bus: Broadway #6 to Spring St. Path-9th St./6th Ave. Station.

COMMERCIAL RADIOS STOCKED: ICOM, Motorola, MAXON, Standard, Yaesu. We serve municipalities, businesses, Civil Defense, etc. Portables, mobiles, bases, repeaters...

We Stock: AEA, ARRL, Ameco, Ameritron, Antenna Specialists, Astatic, Astron, B&K, B&W, Bencher, Bird, Butternut, CDE, CES, Cushcraft, Daiwa, Eimac, Henry, Heil, Hustler, Hy-Gain, Icom, KLM, Kantronics, Larsen, MFJ, J.W. Miller, Mirage, Nye, Palomar, RF Products, Saxton, Shure, Tempo, Ten-Tec, TUBES, Yaesu, Vibroplex, Duplexers, Repeaters, Scanners, Radio Publications, Uniden, Kenwood, Maxon, RFC.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED
COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
Export Orders Shipped Immediately. TELEX 12-7670

ALL SALES FINAL

Technical help offered upon purchase

FAX: 212-925-7001

CIRCLE 41 ON READER SERVICE CARD

Low Cost Discone Antenna

Wideband coverage from 144 to 1296 MHz.

by Phil Salas AD5X

I needed an antenna that would satisfy a lot of needs. After purchasing an ICOM R-7000 receiver (25–2000 MHz) for some experimental work in the UHF and low microwave ham bands, I wanted a good broadband antenna that I could easily mount in my attic and that would provide coverage of the 144, 220, 450, 903, and 1296 MHz ham bands. I also needed this antenna to provide a good match so that it could be used for transmitting within these ham bands as well. Though this sounds like I'm asking a lot, there is a broadband antenna that can satisfy these needs: the discone antenna.

The Discone Antenna

When properly designed, a discone antenna provides decade (10:1) frequency coverage with a good match (see Figure 1). The discone consists of a disk (the driven element) mounted over a conical ground plane. The cone is an equilateral triangle whose dimensions are a quarter wavelength at the lowest operating frequency. The disk (driven element) has a diameter of 70% of a quarter wavelength at the lowest operating frequency. The disk should be very close to the apex of the cone; the recommended spacing is from 10–30% of the diameter of the apex of the cone.

The trick is to be able to easily realize the cone and disk as well as provide a solid insulated support for the disk and a sound mounting method for the overall antenna. Also, this antenna should be inexpensive, and easily constructed with readily available parts from hardware and Radio Shack stores.

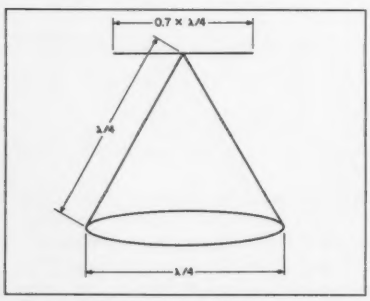


Figure 1. Design for the discone antenna.

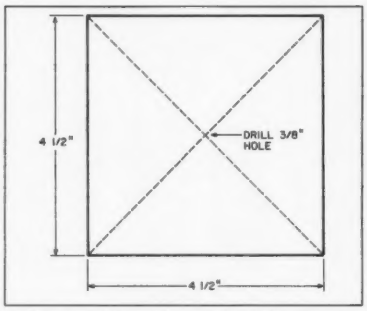


Figure 2. Dimensions of the disk support.

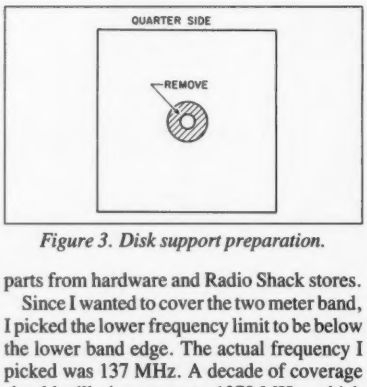


Figure 3. Disk support preparation.

Since I wanted to cover the two meter band, I picked the lower frequency limit to be below the lower band edge. The actual frequency I picked was 137 MHz. A decade of coverage should still give me up to 1370 MHz, which suited my needs. The equation for this is: ¼ wavelength = 2952/137 = 21.5″ = cone side; disk diameter = 0.7 x 21.5″ = 15″.

Now all I had to do was figure out how to build it!

Constructing the Discone

See the "Parts List." The last three items came from Radio Shack. The ⅜″ solder lugs are part of the package (two per package) of solder lugs from Radio Shack, but you can save money if you can find ⅜″ solder lugs separately. I bought all of the other items in the electrical department of a local hardware store.

Now, let's get to work. We will first prepare all the individual pieces.

The disk support will be made out of the single-sided printed circuit board. First, cut this board into a 4½″ x 4½″ square. With a pencil, draw diagonal lines from corner to corner on one side. See Figure 2. Drill a ⅜″ diameter hole at the intersection of the lines (the center of the PC board). Referring to Figure 3, center a quarter over the hole on the foil side of the PC board and trace around its circumference. Using a sharp X-ACTO™ knife, cut through the copper on the circular lines just traced. Now remove the copper *within* the circle. A soldering gun will aid in removing the copper foil.

The light fixture canopy needs some modification. These kits include a fixture for mounting a lamp on, a short length of 1/8IP threaded steel lamp pipe, and some additional hardware. Refer to Figure 4. Nibble or cut a slot along one side of the canopy at least 0.3″ x 0.3″. This will pass the coaxial cable when the canopy and antenna are mounted.

Cut all eight welding rods to a length of 21.5″. Unless you have heavy cutters, you will need to use a hacksaw. Remove any insulation from the ⅜″ solder lugs, insert only one end of the cut welding rods into the solder lug crimp end, crimp the lug and solder. See Figure 5.

Cut the remaining eight short pieces of welding rods to 7¼″. Finally, determine the center of the 4″ round plastic electrical box cover and drill a ⅜″ hole. It is important that this hole be well-centered, so take care in determining this location.

Now take the 30″ 1/8IP all-thread steel lamp pipe and carefully tin one end of the pipe. See Figure 6. Be careful not to get solder on the threads of the pipe. This pipe is

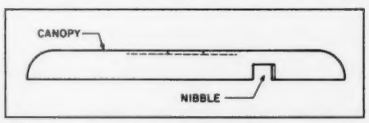


Figure 4. Modifying the light fixture canopy.

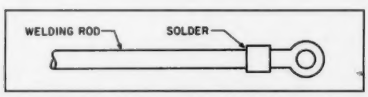


Figure 5. Element preparation.

HAM RADIO TOY STORE, Inc.

MasterCard VISA

UNCLE ELMER SAYS: Come in and operate our demo station featuring TEN-TEC radios.

CALL for low prices.

TEN-TEC

117 WEST WESLEY STREET - WHEATON, IL 60187 - (708) 668-9577

Field Operations

Tektronix 35 MHZ Portable scope, 2 Ch., 22 lbs., 0.5 sec./0.1us sweep, 2 mv/10m/Div .... $260. New probes 1/10x $20
Phillips PM3212 Portable scope, 2 Ch., 20 lbs., 0.5 s/20ns sweep 2/mv/10V/Div, 120v @ 60Hz or 24 VCD Batt. for field use $160
Your picture & call nos. on T-shirt. Send photo $15
U.P.S. collect, cash or certified check.

FOSTER GRAPHICS
186 MAIN STREET
MARLBORO, MA 01752
Ph. or FAX: 508-624-7703

CIRCLE 300 ON READER SERVICE CARD

Subscribe to *73 Amateur Radio Today*
1-800-722-7790

ELENCO & HITACHI PRODUCTS AT DISCOUNT PRICES

48 HOUR SHIPPING — 48 HOUR SHIPPING

Hitachi RSO Series
(Portable Real-time Digital Storage Oscilloscopes)
VC-6023 - 20MHz, 20MS/s _____ $99/mo*
VC-6024 - 50MHz, 20MS/s _____ $120/mo*
VC-6025 - 50MHz, 20MS/s _____ $136/mo*
VC-6045 - 100MHz, 40MS/s _____ $125/mo*
VC-6145 - 100MHz, 100MS/s _____ $200/mo*

RSO's from Hitachi feature roll mode, averaging, save memory, smoothing, interpolation, pretriggering, cursor measurements. These scopes enable more accurate, simpler observation of complex waveforms, in addition to such functions as hardcopy via a plotter interface and waveform transfer via the RS-232C interface. Enjoy the comfort of analog and the power to digital.

LEASING AVAILABLE
For all Hitachi Scopes - Call for details
* Based on 24 months except V-1150, VC-6045, VC-6145 (36 months)

Hitachi Portable Scopes
DC to 50MHz, 2-Channel, DC offset function, Alternate magnifier function
V-525 - CRT Readout, Cursor Meas. __ $1,025
V-523 - Delayed Sweep _____ $995
V-522 - Basic Model _____ $895
V-422 - 40MHz _____ $795
V-223 - 20MHz delayed sweep _____ $695
V-212 - 20MHz _____ $425

HITACHI COMPACT SERIES SCOPES
This series provides many new functions such as CRT Readout, Cursor measurements (V-1085/1065/665), Frequency Ctr (V-1085), Sweeptime Autoranging, Delayed sweep and Tripper Lock using a 6-inch CRT. You don't feel the compactness in terms of performance and operation.
V-660 - 60MHz, Dual Trace _____ $1,195
V-665 - 60MHz, DT, w/cursor _____ $1,345
V-1060 - 100MHz, Dual Trace _____ $1,425
V-1065 - 100MHz, DT, w/cursor _____ $105/mo*
V-1085 - 100MHz, QT, w/cursor _____ $125/mo*
V-1100A - 100MHz, Quad Trace _____ $125/mo*
V-1150 - 150MHz, Quad Trace _____ $115/mo*

20MHz Elenco Oscilloscope

$375
MO-1251
• Dual Trace
Component Tester
• 6" CRT
• X-Y Operation
• TV Sync
• 2 P-1 Probes

FREE DMM with purchase of ANY SCOPE

SCOPE PROBES
P-1 65MHz, 1x, 10x $19.95
P-2 100MHZ, 1x, 10x $26.95

Elenco 35MHz Dual Trace

Good to 50MHz $495
MO-1252
• High luminance 6" CRT
• 1mV Sensitivity
• 6KV Acceleration Voltage
• 10ns Rise Time
• X-Y Operation + Z Axis
• Delayed Triggering Sweep
• Includes 2 P-1 Probes

All scopes include probes, schematics, operators manual and 3 year (2 yrs for Elenco scopes) world wide warranty on parts & labor. Many accessories available for all Hitachi scopes. Call or write for complete specifications on these and many other fine oscilloscopes.

B&K TEST EQUIPMENT
All Models Available
Call for special price

FLUKE MULTIMETERS
All Models Available
Call for special price

Digital Capacitance Meter CM-1550B

$58.95
9 Ranges .1pf-20,000ufd
5% basic accy.
Zero control w/ Case
Big 1" Display

Digital LCR Meter LC-1801

$125
Measures:
Coils 1uH-200H
Caps .1pf-200uf
Res .01-20M

Multimeter with Capacitance & Transistor Tester

$55 CM-1500B
Reads Volts, Ohms Current, Capacitors, Transistors and Diodes / with case
Big 1" Display

Soldering Station Temperature Controlled SL-30 $99

Digital Display
Temp Range: 300F~900F
Grounded Tip
Overheat Protect

Color Convergence Generator SG-200

Finest in the industry
10 rock steady patterns $69.95

Four-Function Frequency Counters

F-100 120MH $179
F-1000 1.2GH $259
Frequency, Period, Totalize, Self Check with High Stabilized Crystal Oven Oscillator, 8 digit LED display

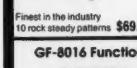
Function Generator Blox #9600 $28.95

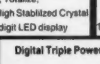
Provides sine, triangle, square wave from 1Hz to 1MHz AM or FM capability

AM/FM Transistor Radio Kit with Training Course
Model AM/FM 108
$26.95
14 Transistors • 5 Diodes
Makes a great school project

True RMS 4 1/2 Digit Multimeter M-7000

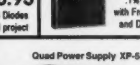
$135
.05% DC Accuracy
.1% Resistance
with Freq. Counter and Deluxe Case

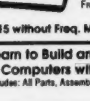
GF-8016 Function Generator with Freq. Counter

$249
Sine, Square, Triangle
Pulse, Ramp, .2 to 2MHz
Freq Counter .1 - 10MHz
GF-8015 without Freq. Meter $179

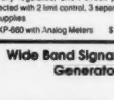
Digital Triple Power Supply XP-765

$269
0-20V at 1A
0-20V at 1A
5V at 5A
Fully regulated, Short circuit protected with 2 limit control, 3 separate supplies
XP-660 with Analog Meters $195

Triple Power Supply XP-620 Assembled $69 Kit $45

2 to 15V at 1A
-2 to -15V at 1A
(or 4 to 30V at 1A)
and 5V at 3A
Contains all the desired features for doing experiments. Features short circuit protection, all supplies.

Quad Power Supply XP-580 $59.95

2-20V at 2A
12V at 1A
5V at 3A
-5V at .5A
Fully regulated and short circuit protected

Learn to Build and Program Computers with this Kit
Includes: All Parts, Assembly and Lesson Manual
Model MM-8000
$129.00

Starting from scratch you build a complete system. Our Micro-Master trainer teaches you to write into RAMs, ROMs and run a 8085 microprocessor, which uses similar machine language as IBM PC.
Robotics Kit for above (MM8010) 71.95

Wide Band Signal Generators

SG-9000 $129
RF Freq 100K-450MHz AM Modulation at 1KHz Variable RF output
SG-9500 w/ Digital Display & 150MHz built-in Counter $249

First TWIN BAND HT made for the U.S. market!

STANDARD C228A TRUE TWIN BAND 144 and 220 MHz HT
Now there's a new STANDARD in Amateur Radio
Two friendly bands in ONE HT. 144 and 220 MHz
The best combination now and in the future
CALL FOR PRICING
• Lowest Power requirement for maximum battery life What good would all these features be if your battery was dead?
• Logical operation - read the manual once and put it away forever
• Unbeatable 0.158 uV receiver sensitivity - most important in an HT
• Wide band extended receiver coverage lets you monitor other services.
• Unique base loaded antenna out performs simple "rubber duck" antenna and works well out of band also!
• 40 channel memory with 2 call channels, can store up to 20 offsets and CTCSS tones
• DTMF memory stores your favorite telephone number
• True TWIN band HT with separate volume and squelch controls
• Receives both bands at the same time for maximum performance
• Repeater cross band mode use as a temporary link or add a new input to your existing repeater. Select 3 second hang "on" or noisy
• Direct frequency input via the keyboard or dial in the frequency with the rotary channel selector
• Large, easy to read TWIN frequency display
• Versatile scanning modes lets you locate the action quickly
• Includes high density 700 mAh battery and charger
• 5.0 watts (high power when operated from 12 VDC) transmitter output power both bands with three programmed power set tings
• Optional Accessories include a complete line of Batteries, Desk Charger, Headset with PTT and Water resistance case
• 1 Yr Warranty
NEW TWIN BAND MOBILE 2M/440MHZ Call for pricing

WE WILL NOT BE UNDERSOLD!
UPS Shipping: 48 States 5%
($3 Min $10 Max) Shipping
IL Res. 7% Tax FAX: 708-520-0085

C & S SALES INC.
1245 Rosewood, Deerfield, IL 60015
(800) 292-7711 (708) 541-0710

15 Day Money Back Guarantee
2 Year Warranty
Prices Subject to Change
WRITE FOR FREE CATALOG

CIRCLE 184 ON READER SERVICE CARD

The only Coax Protector that works for Lightning and EMP...

...on ALL your equipment

Did you know that DC continuity lightning arrestors don't work on: Receivers, Cavities (Shunt Fed), and Isolators?

- For Coax 50, 75 and 93 ohm systems to 6.0 GHz.
- For Telephone, current loop, RS-232 and T-1.
- For 120, 240 and 480 VAC single and three phase powerline.

For these and any of our other 1500 protectors and grounding systems contact

PolyPhaser CORPORATION
P. O. Box 9000
Minden, NV 89423-9000
(800) 325-7170
(702) 782-2511
FAX: (702) 782-4476

CIRCLE 49 ON READER SERVICE CARD

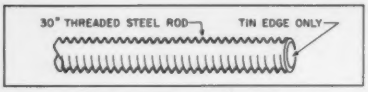


Figure 6. Tinning the pipe.

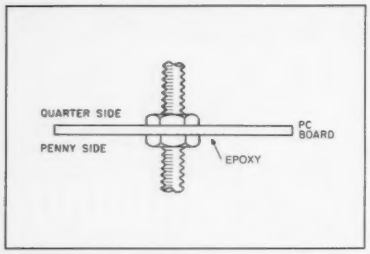


Figure 7. Disk support assembly.

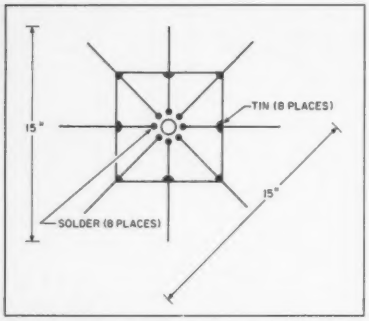


Figure 8. Tinning and soldering the top of the PC board.

not difficult to tin since it is made of steel, which doesn't conduct heat away as fast as copper or brass does. Cut 1" of the outer insulation off the RG-8M coaxial cable, separate the braid, and then fold it back over the cable insulation. Insert this end of the RG-8M cable into the non-tinned end of the 30" lamp pipe and push the cable through until the braid is flush with the tinned end of the pipe. Solder the braid to the pipe at this point.

Next, prepare the disk support printed circuit board. Insert a short length of steel lamp pipe (provided with the canopy kit) through the center hole in the printed circuit board and fasten it securely in place with two brass nuts. See Figure 7. Epoxy the brass nut to the PC board opposite the foil side. Be careful not to get epoxy on the threads. Now, remove the nut from the side of the board not epoxied, and unscrew the steel pipe from the nut still attached to the PC board. The side of the PC board with the nut will now be referred to as the bottom of the disk support PC board.

On the top of the PC board, tin each corner and tin the midpoint of each side. See Figure 8. Now solder down the 7¼" welding rods to the PC board, making sure that the total length from outer point to outer point is 15". You are creating a disk 15" in diameter out of the eight welding rods. Now go back and solder the inside edge of the welding rods to the PC board. Finally, place the 1" diameter brass washer over the ends of the welding rods centered over the hole in the PC board and solder the washer to the rods. See Figure 9.

Now it's time to start assembling the antenna. First, screw the end of the 30" pipe with the RG-8M center conductor sticking out into the nut on the bottom of the PC board. Screw it in just far enough so the end of the pipe is flush with the printed circuit side of the soldered down nut. The center conductor of the RG-8M will pass through the center of the brass washer on the top of the PC board.

Next, place the solder lugs of the eight long steel welding rods over the 30" steel pipe and hold them in place with a 1/8IP brass nut. Put this nut on finger-tight and then arrange each long rod so that it is exactly under each short rod on the top of the PC board. Carefully tighten the brass nut. Thread another brass nut on the steel pipe and position it about 3" below the nut holding the long rods in place. Hold the pipe upright with the PC board at the upper end, then bend all

Parts List

Description	Approximate Cost
1" diameter brass washer	$ .10
30" 1/8IP all-thread steel lamp pipe	$ 3.17
1 light fixture canopy kit	$ 2.45
6 brass 1/8IP nuts (pkg. of 6)	$ .99
1 plastic 4" round electrical box cover	$ .17
10 feet #12 copper wire ($.07/ft.)	$ .70
8 copper plated steel welding rods ($.20 ea.)	$ 1.60
12" x 24" x 1" piece of wood	$ 1.00
4½" x 4½" single-sided PC board	$ 3.99
6 ⅜" solder lugs (RS 64-3040 x 3)	$ 3.87
5 feet RG-8M (RS 278-1328 0.27 x 5)	$ 1.35
Total	$19.39

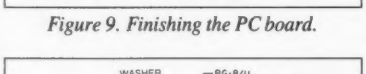


Figure 9. Finishing the PC board.

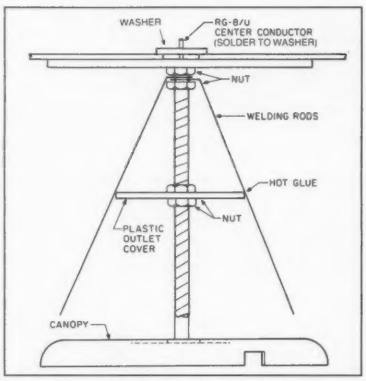


Figure 10. Assembling the discone.

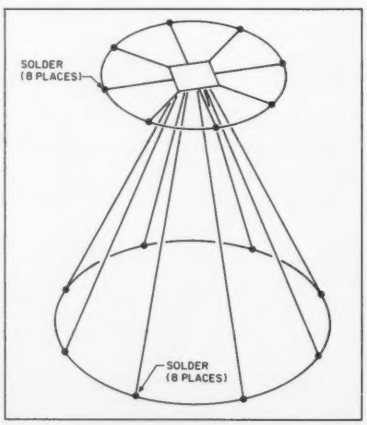


Figure 11. Wire placement.

the long rods down along the steel pipe. Place the plastic electrical outlet cover over the steel pipe and thread on another brass nut. Push the electrical outlet cover up the pipe and spread the long welding rods until the bottom ends of the rods are 21.5" apart from their opposite rod. Adjust the nut positions as necessary and tighten the nuts to hold the electrical outlet cover in place. See Figure 10. I used a hot glue gun to attach the long welding rods to the plastic electrical outlet cover to help with the antenna rigidity, but this is not really necessary.

Strip the insulation off the RG-8M center conductor as it passes through the brass washer on the top of the printed circuit board. Solder the center conductor to the brass washer. Now, mount the antenna to the canopy by threading another brass nut over the end of the steel pipe, passing the cable and pipe through the hole in the canopy, and threading another nut over the pipe and tightening it. You can now attach the canopy to a piece of wood (I used a 1' x 1' x 1" board), thus allowing the antenna to stand freely.

The last thing to do is to solder a piece of #12 copper wire around the circumference of the disk and cone. Cut a 50" piece of wire for the disk and a 70" piece of wire for the base of the cone. Tin the ends of each of the welding rods and solder the copper wire to them. See Figure 11. Though it is not really necessary to tie all the welding rod ends together, this and the hot glue mentioned earlier make the antenna very rigid.

Finally, attach your connector of choice to the end of the RG-8M coming from the discone. RG-8M has the same dimensions as RG-59. A PL-259 UHF connector with a RG-59 reducer or a BNC connector for RG-59 cable work well.

Operation

How does it work? I measured an SWR of less than 1.5 to 1 on all ham bands between 144 and 1296 MHz. I placed the antenna on its wood base in my attic and it provides excellent general coverage reception, as well as transmission in the covered ham bands. Not bad for about an hour's worth of work and less than $20 worth of parts! 73

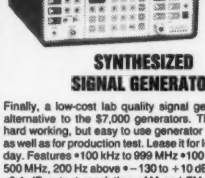
Contact Phil Salas AD5X at 1517 Creekside Drive, Richardson TX 75081.

RAMSEY ELECTRONICS

COM-3 $279.95

2 WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.



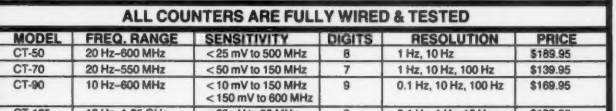
RSG-10 $249.95

SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • –130 to +10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

FREQUENCY COUNTERS

CT-70 7 DIGIT 525 MHz **CT-90 9 DIGIT 600 MHz** **CT-125 9 DIGIT 1.2 GHz**



Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one-year warranty on parts and labor. We take great pride in being the largest manufacturer of low-cost counters in the entire U.S.A. Compare specifications. Our counters are full-featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry, and durable high quality epoxy glass plated-thru PC board construction. All units are 100% manufactured in the U.S.A. All counters feature 1.0 ppm accuracy.

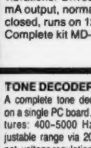
NEW CT-250 2.5 GHZ

ACCESSORIES FOR COUNTERS

Telescopic ship antenna—BNC plug, WA-10	$11.95
High impedance probe, light loading, HP-1	$16.95
Low-pass probe, audio use, LP-1	$16.95
Direct probe, general purpose use, DC-1	$16.95
Tilt bail, elevates counter for easy viewing, TB-70	$9.95
Rechargeable internal battery pack, BP-4	$9.95
CT-90 oven timebase, 0.1 ppm accuracy, OV-1	59.95

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	<25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	<50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	<10 mV to 150 MHz <150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	<25mV to 50 MHz <15 mV to 500 MHz <100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	<25 mV to 50 MHz <10 mV to 1 GHz <50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$239.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	<50 mV	Convert your existing counter to 1.5 GHz		$89.95



SPEED RADAR $89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes delivery. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

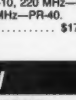
BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 50Ω NF. BNC connectors. Runs on 12 VDC or 110 VAC.
PR-2, wired, includes AC adapter $59.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.
PA-1, 40W pwr amp kit $29.95
TR-1, RF sensed T-R relay kit .. $ 8.95

FM WIRELESS MIKE KITS



FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88–108 MHz FM band up to 300' except for hi power FM-4 that goes up to ½ mile.
FM-1, basic unit ..... $ 5.95
FM-2, as above but with added mike preamp ..... $ 7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away $14.95
FM-3, complete unit includes case, battery, switch, antenna, and built-in condensor mike. Excellent fidelity, very small, kit $16.95
FM-3WT, as above, but fully wired and tested $19.95
SMC, miniature sensitive mike cartridge for FM-1, 2, 4 ..... $ 2.95

MICROWAVE INTRUSION ALARM

A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.
Complete kit MD-3 . $16.95

MUSIC MACHINE

Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.
Complete kit, MM-5 ..... $24.95
Case + knob set, CMM-5 $12.95

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.
Complete kit, PC-1 .... $49.95

LO NOISE PREAMPS

Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.
Each kit $17.95

TONE DECODER

A complete tone decoder on a single PC board. Features: 400–5000 Hz adjustable range via 20-turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 . $5.95

VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.
VS-1 kit. $6.95

TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!
PB-1 kit $14.95

NEW

SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.
SP-1 .....$29.95 Case-CSP $12.95

TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!
TS-4 kit $9.95

LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug."
Transmitter + receiver set, LB56 .. $19.95

FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!
FR-1 kit $14.95

SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.
BN-9 kit $5.95

BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
SA-7 kit $14.95

NEW FANTASTIC 2M FM TRANSCEIVER

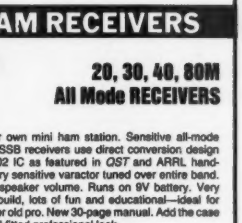
SYNTHESIZED—NO CRYSTALS TO BUY!

$149.95

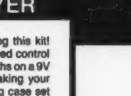
Ramsey breaks the price barrier on 2 meter rigs! Here's the ideal rig for field days, hamfests, vacations, second cars and packet (it even has dedicated packet connections). Six expandable diode-programmed channels, 5W RF output, sensitive dual conversion receiver and EASY assembly. Why pay more for a secondhand old rig when you can make your own for less. Have some fun with your own truly AMERICAN-MADE FM rig! This kit comes complete except for the case, mike and speaker—ICOM or equal speaker-mikes plug right in. Add our own beautiful case set for a professional factory look.
FTR-146 kit $149.95
FTR-146-C metal case & knob set $24.95

2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.
PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $79.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested $79.95



QRP TRANSMITTERS HAM RECEIVERS



20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.
Your choice of bands $29.95
(Specify band: QRP-20, 30, 40 or 80)
Matching case & knob set, CQRP $12.95

20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in *QST* and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.
Your choice of bands $27.95
(Specify band: HR-20, HR-30, HR-40, HR-80)
Matching case & knob set, CHR $12.95

E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.
CW-7 kit $24.95
Matching case knob set, CCW $12.95

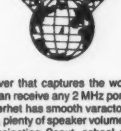
ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!
AA-7 Kit $24.95
Matching case & knob set, CAA $12.95

SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.
SS-7 kit $29.95
Matching case & knob set, CSS $12.95

SHORTWAVE RECEIVER



Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!
Shortwave receiver kit, SRI $27.95
Shortwave converter kit, SCI $24.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

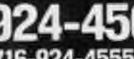
2, 6, 10 MTR, 220 FM RECEIVERS

Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.
FM communications receiver kit $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR $12.95

FM STEREO TRANSMITTER

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!
FM-10 kit $29.95
Matching case set, CFM $12.95

AIRCRAFT RCVR



Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–138 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.
AR-1 kit $24.95
Matching case set, CAR $12.95

TERMS: Satisfaction guaranteed: examine for 10 days. If not pleased, return in original form for refund. •Add 7% (up to a maximum of $10) for shipping, handling and insurance. •For foreign orders add 15% for surface mail. •COD (USA only): add $4.50. •Orders under $20, add $3.00. •NY residents, add 7% sales tax. •90-day parts warranty on kits. •1-year parts & labor warranty on wired units.

VISA MasterCard

PHONE ORDERS CALL 716-924-4560

FAX 716-924-4555

RAMSEY ELECTRONICS, INC. 793 Canning Parkway, Victor, NY 14564

CIRCLE 34 ON READER SERVICE CARD

High Speed Data Acquisition

Sample the outside world with this inexpensive interface.

by Mike Gray N8KDD

Personal computers have made huge improvements in nearly every field, including the scientific and engineering communities, acquiring and processing data for research projects. Hams, too, have made extensive use of computers, and many have an interest in using them for data acquisition.

To do this, all a computer needs is an input device and appropriate software. The keyboard is the most commonly used input device. Data taken manually from individual instruments is recorded on paper and entered later. However, keyboards are unacceptably slow for most projects, so an instrument such as a datalogger or a data-acquisition card is used.

Information stored in a datalogger is usually entered into the computer through the serial port, sometimes by means of a telephone or radio modem. Commercial dataloggers are too costly for most of us to justify the purchase of even the least expensive model.

A bus-oriented data acquisition card installed in a personal computer is a powerful, though expensive way to build a digital data acquisition system. Most portable computers will not accept a data acquisition card, so work is usually confined to a laboratory using a desk computer.

Many projects need only one channel of data, acquired at relatively high speed, and this project will satisfy that requirement at very low cost.

Hacker Method

Another means of getting data into a computer is through the parallel printer port. This port is generally not used for anything but driving a printer, but like most things, it can be adapted (hacked?) to other uses. Data can be transferred much faster in parallel than in serial form.

There are three port addresses at the printer connector of IBM-compatible computers. At 378 (hexadecimal) is the 8-bit data word. This address is all that we'll discuss for now. Address 378 is LPT1, and most compatibles are configured in this manner. LPT2 is address 278 (hex). Some computers may be configured such that the data lines appear at address 3BC (hex); check your manual for the proper address for your system. Note that the BASIC program will have to modified for your computer system's port address if different than 378 (hex).

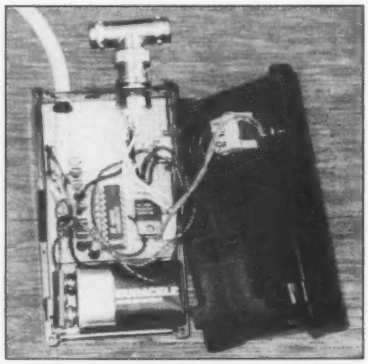


Photo A. Inside view of the A-D box.

Printer connector pins 2–9 correspond to data bits 0–7. Pins 18–25 are grounded. If a pin is high, grounding that pin saturates the output driver and the logic state changes from 1 to 0. Communicating over the parallel port in this manner is easy, but it also inverts the conversion result. It's a simple matter to fix that in the software.

A-D Converter

An analog-to-digital (A-D) converter chip converts an analog value to its binary equivalent. The chip requires a reference voltage, against which the analog signal is compared. In most cases, the reference voltage is 5 volts, the same as the supply voltage.

The Data Bit output lines are numbered DB0–DB7. These lines are connected to pins 2–9 at the computer printer connector.

If the analog input voltage is zero, all eight lines will be low (0 volts), and the decimal value of the 8-bit data word will be zero. If the analog input is greater than or equal to the reference voltage, all eight lines will be high (5 volts), and the decimal value of the 8-bit data word will be 255. An 8-bit A-D converter has a maximum resolution of 256 (0–255 counts).

The amount of current required to drive the printer port of many computers is greater

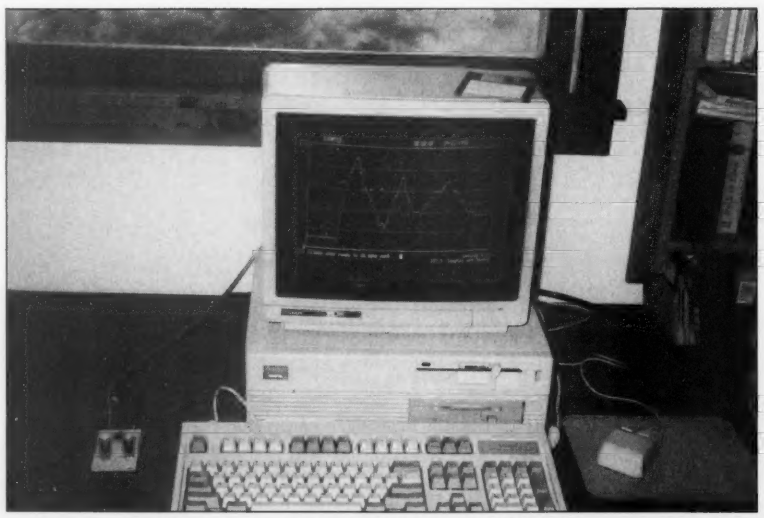


Photo B. The interface hooked up to an IBM PC clone.

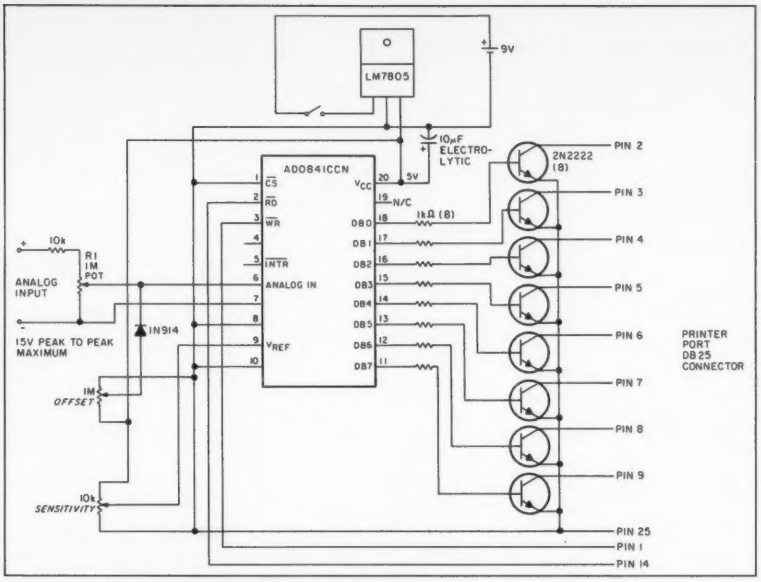


Figure 1. Schematic diagram of the interface.

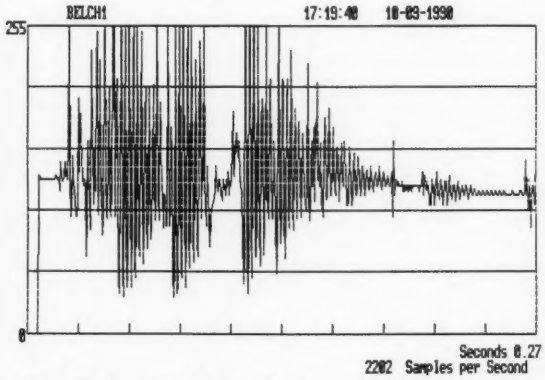


Figure 2. Unusual audio waveform as sampled by the interface.

than the A-D converter chip can handle, so external drivers are necessary. I chose common NPN transistors.

In addition to the data bit lines 0–7, two more lines from the printer connector are required. These control the A-D converter. They are found at address 37A (LPT1), 27A (LPT2) or 3BE on some computers. Pin 1 controls when the chip performs a write (WR), and pin 14 controls when the chip performs a read (RD). Both lines need to be set high initially, then WR is pulled low, which starts a conversion. After WR is asserted high, RD can be pulled low and the conversion result will appear at the output lines.

Precaution

Grounding any of the printer port pins 2–9 pulls the voltage below the threshold necessary for the computer to recognize a logic 1. The logic levels vary, but all are under 0.8 volts. Some computers are capable of driving very high loads, which means that the current required to pull the pin voltage below the logic level threshold could be as high as 60 mA per pin.

In testing five different computer brands, I have not found even one to be damaged by grounding these pins, but the drivers may get warm after a while. In order to protect the computer from any possible damage, the printer port should be held in a high state only long enough to read an input from the A-D converter. The software will accomplish this.

Once completed and working, the converter should not be connected to the computer for more than 10 to 20 minutes, unless the converter is off, the analog input is zero, or the software is running. The software program allows current to flow only long enough to read the port.

Construction

Since the component count is low, the circuit can be assembled on perfboard. The chip is static-sensitive, so mount a 20-pin socket to the board and install the chip only after assembly is complete and the wiring has been checked.

The sample rate is entirely dependent upon the speed at which the computer can toggle the WR and RD lines, and interrogate the printer port. The operation of this chip is described in greater detail in the *National*

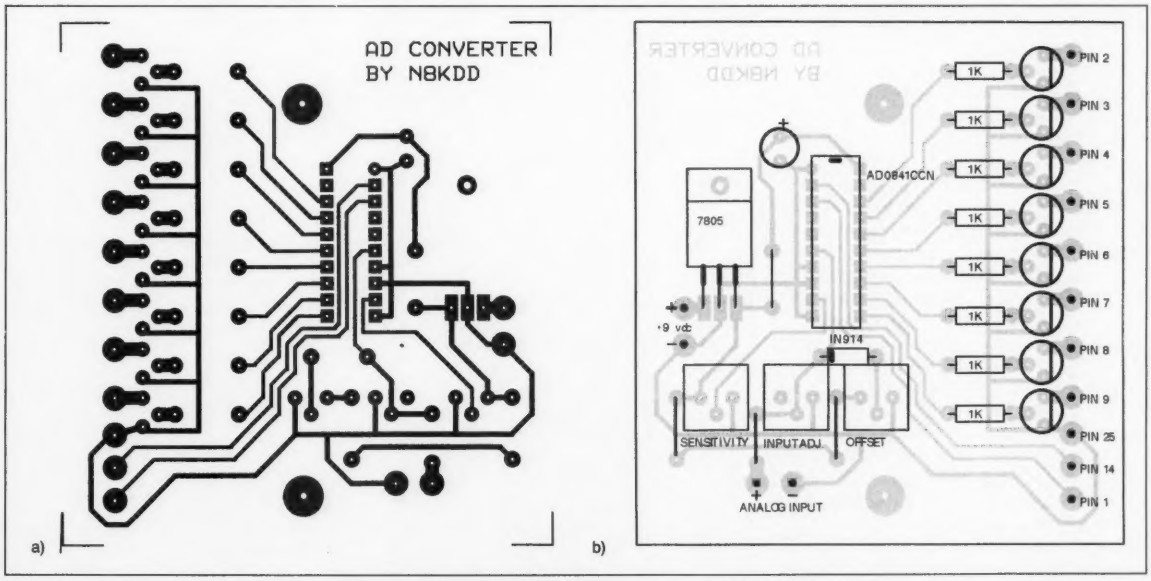


Figure 3 (a). PC board foil pattern. (b). Parts placement.

Semiconductor Linear Databook, Volume 2.

The A-D converter chip may be destroyed if more than 5.1 volts are applied to the input. R1 should be adjusted to divide the input voltage by three, so that there won't be any damage unless the input is greater than 15 volts. The offset and sensitivity potentiometers allow the instrument to measure bipolar inputs, and to measure low level signals with good resolution. If you measure only signals between 0 and 5 volts, all three pots may be eliminated.

Smoke Test

Make sure the power switch on the converter is off, then plug the DB-25 connector into the printer port on the computer. Load BASIC and add the following line to the program listed in the sidebar:

```
65 Y=255-Y.
```

(Since the NPN transistors cause a bit inversion, the bits must be inverted again in order to get representative data.) Now run the program listed in the sidebar.

Adjust the offset and sensitivity pots to midscale and turn the power switch on. The display will read something between 0 and 255, depending on where the pots are set. Turn the offset pot and watch the decimal value change.

Software Suggestions

The application possibilities are endless, and everyone has his own particular reason for getting analog information into his digital computer. An experienced Gizmologist should be able to build a custom program around the core program listed in the sidebar.

You can connect many different transducers to your new A-D converter. I have used these transducers with good results: audio, position, displacement, temperature, strain.

The software you write can convert the raw A-D counts to engineering units for you. If, for example, you have a position transducer which produces 5 volts when it is 100 percent extended, simply divide the variable "Y" by 2.55 (Y=Y/2.55).

The computer can make graphs while taking data, although the more you ask the computer to do, the slower it gets. If you want speed, acquire the data first, then plot it. The plot in Figures 2 were made with an IBM AT using the acquire-then-plot technique. The transducer was an audio amplifier. If you measure some slowly changing physical event such as temperature, program execution speed is not of much concern, but an accurate time base is. If you would like a copy of some general purpose, graphic-oriented programs, you can download them free from the *73 Magazine BBS* at (603) 525-4438 or send $6 to me at the address below. Be sure to specify whether you would like a 5.25 or 3.5 inch disk.

A 9 volt alkaline battery will last about six hours in continuous use. You could use a filtered power supply or larger battery pack if you need longer service. 73

Contact Mike Gray N8KDD at 465 W. Maple Rd., Milford MI 48381.

Parts List

1	ADC0841CCN	A-D converter (price is under $10)	Pioneer Standard Electronics, 13485 Stamford, Livonia MI 48150
8	2N2222	NPN Transistors (metal can preferred)	
8		1k ohm resistors, ¼ watt	
1		1 megohm board mount potentiometer	
1		10k ohm fixed resistor	
1		10k ohm panel mount potentiometer	
1		1 megohm panel mount potentiometer	
1	LM7805	5 volt regulator	
1		SPST panel mount switch	
1		9 volt battery clip	
1		10 µF electrolytic capacitor	
1	DB25	Male printer port connector	
1	1N914	Diode	
		About 2 feet of 11 (or more) conductor cable	
1	276-150	IC circuit board (Radio Shack)	
1		20-pin IC socket	

(Most of these components can be purchased at Radio Shack. You may also be able to order the A-D chip at a local Radio Shack.)

Note: A blank PC board is available for $4 + $1.50 shipping from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

Port Experiments

In the following experiments, I used BASIC to control the A-D converter and read the printer port. Any other programming language will work, but I like BASIC because it's so easy to use and explain. All of the *.EXE files for my applications were written using Borland's Turbo BASIC™, and the source code is available for those who want to write their own software applications. Turbo BASIC runs about eight times faster than BASIC interpreter.

The following program reads the bit status at the printer port. The monitor displays the decimal value and bit status of a byte read from the printer port.

BASIC Interpreter (BASICA or GW-BASIC)

```
10 OUT &H37A,12                          'WR and RD high
20 OUT &H37A,13                          'WR low
30 OUT &H37A,12                          'WR and RD high
40 OUT &H37A,14                          'RD low
50 OUT &H378,255                         'latch all bits high
60 Y=INP(&H378)                          'input 1 byte (variable y)
70 PRINT Y,BIN$(Y)                       'print Y (decimal and binary)
80 OUT &H378,0                           'latch all bits low
90 Q$=INKEY$                             'keyboard trap
100 IF Q$="q" OR Q$="Q" THEN END         'if user enters q then quit
110 FOR D=1 to 2000:NEXT                 'time delay
120 GOTO 10
```

Turbo BASIC

```
do
out &H37A,12                             'WR and RD high
out &H37A,13                             'WR low
                                         out &H37A,12 'WR and RD high
out &H37A,14                             'RD low
out &H378,255                            'latch all bits high
y=inp(&H378)                             'input 1 byte (variable y)
print y,bin$(y)                          'print y (decimal and binary)
out &H378,0                              'latch all bits low
q$=inkey$                                'keyboard trap
if q$="q" or q$="Q" then end             'if user enters q then quit
delay .5                                 'time delay
loop
```

You should see 255 11111111 on your monitor. If not, double check the program code and run it again. You may need to change the port address from &H378 to &H3BC. While the program is running, connect a jumper wire between pin 25 and pin 9. The display will now read 127 01111111. The left-most bit is the most significant. It has a value of 128. Connect pin 25 to pin 2. The decimal value is now 254. Pin 2 is the least significant bit of the 8-bit word and it has a value of 1. Try connecting each pin to pin 25, and watch the display. You will see this pattern develop:

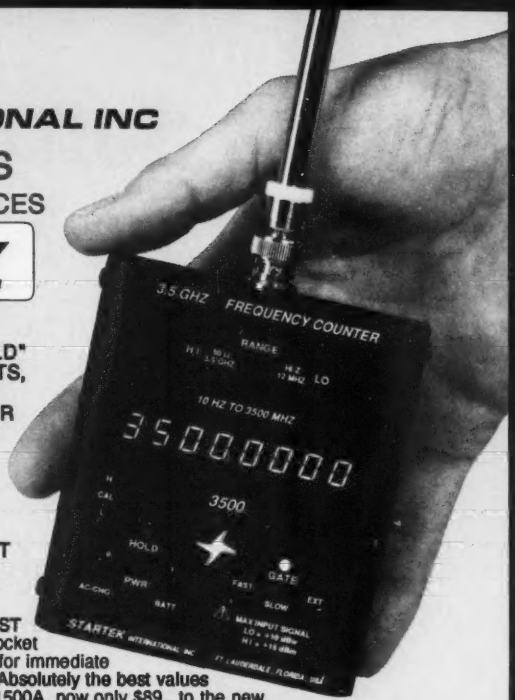
Bit	Pin	value (bit high)	
0	2	1	least significant bit
1	3	2	
2	4	4	
3	5	8	
4	6	16	
5	7	32	
6	8	64	
7	9	128	most significant bit

STARTEK INTERNATIONAL INC

FREQUENCY COUNTERS

GREAT NEW MODELS - SUPER LOW PRICES

10 HZ to 3.5 GHZ



- StarCab™ ALUMINUM CABINET
- 8 RED LED DIGITS
- 3 GATE TIMES
- DISPLAY HOLD
- MMIC AMPLIFIERS
- 3-5 HR BATTERY
- NI-CAD'S & ADP
- YEAR WARRANTY
- MADE IN USA

THE NEW MODEL 3500

FROM THE ORIGINATOR OF THE "HAND HELD" COUNTERS IN THE StarCab™ STYLE CABINETS, WITH EXPERIENCE PRODUCING OVER TWO DOZEN SUCCESSFUL FREQUENCY COUNTER MODELS SINCE 1975, FRED HUFFT- W4PLM HAS DESIGNED THE 3500 WITH UNPRECEDENTED FREQUENCY RANGE, FEATURES AND QUALITY IN A VERY AFFORDABLE "POCKET SIZED" COUNTER.

COMPUTER DESIGN AND STATE OF THE ART COMPONENTS PROVIDE UNCOMPROMISED RELIABILITY AND PERFORMANCE.

A VERY SPECIAL OFFER

MODEL **1500A**

$66*

* Buy this quality 1500 MHZ Counter for only $66. when purchased with the following items:

■ 1500A FREQ COUNTER	~~$89.00~~	66.00
■ INSTALLED NI-CAD PACK	20.00	
■ 110VAC ADP/CHARGER	9.00	
■ 12VDC AUTO ADP/CHGR	9.00	
■ VINYL CARRY CASE	12.00	
■ TELESCOPING ANTENNA	12.00	
#SO-15	~~$151.00~~	128.00

ONLY $128. FOR ALL 6 ITEMS

TO SUBSTITUTE MODEL 1500HS ORDER #SO-HS $175.
2500 #SO-25 225.
3500 #SO-35 265.

1.6 GHZ PRESCALER - AMP & SIGNAL BAR GRAPH

Extend range of any counter capable of counting 16 MHZ or higher to 1600 MHZ with super sensitivity of 1-5 mV typ. 10 segment LED BAR GRAPH displays RF signal strength. StarCab™ aluminum cabinet. 110 VAC adaptor included.

MODEL AP-90
FACTORY ASSEMBLED
1 YEAR WARRANTY

$99

FIND FREQUENCIES FAST with any of these great pocket sized counters, available for immediate delivery from STARTEK. Absolutely the best values in the industry, from the 1500A, now only $89., to the new 2500 & 3500. These new full range counters feature a 1 megohm input 10 Hz to 12 MHz, a 50 ohm RF input 10 MHz to 2.4 GHz / to 3.5 GHz for the 3500. The 2500 & 3500 both feature MMIC amplifiers for maximum sensitivity, three gate times for maximum display resolution of .1 Hz to 12 MHz and 10 Hz to 2400 & 3500 MHz, a DISPLAY HOLD switch and LED indicator to hold a reading and suspend gating until turned off. Our DISPLAY HOLD switch works properly, it does not change the GATE selection when turned off, like some competitive units. All of our counters use LSI circuitry, sub-miniaturized components and low power design for portable operation of 3-5 hours from internal 600 mA/Hr NiCad batteries. For ULTRA HIGH SENSITIVITY the 1500HS can't be beat with typical sensitivity of <.5 to <1 mV RMS from 10 MHz to 500 MHz. Our 1500A offers great quality and performance at minimal cost. All counters have a full year parts & labor limited warranty. Check out our VERY SPECIAL OFFER for any model packaged with several of our most popular accessories.

1500A	1500 HS	2500	3500
ECONOMY MODEL	ULTRA HIGH SENSITIVITY	FULL RANGE +HI-Z INPUT	EXT RANGE +HI-Z INPUT
1-1500 MHZ	1 MHZ-1500 MHZ	10 HZ-2400 MHZ	10 HZ-3500 MHZ
2 GATE TIMES	2 GATE TIMES	3 GATE TIMES	3 GATE TIMES
LESS NI-CADS & AC ADP	DISPLAY HOLD	DISPLAY HOLD	DISPLAY HOLD
$89.	**$159.**	**$210.**	**$250.**

■ OPTIONS for the 1500A

#BP-15	NiCads for 1500A (installed)	$ 20.00
#AC-15	110 VAC adp/chgr for 1500A	9.00

■ ACCESSORIES for all models

#TA-90	Telescoping BNC antenna	12.00
#RD-800	800 MHZ Rubber Duck-BNC	29.00
#CC-90	Black vinyl zipper carry case	12.00
#DC-690	12VDC Auto adaptor/charger	9.00

■ PROBES

#LP-22	Probe, Low Pass/Audio use with 2500 & 3500. Attenuates RF noise.	$22.00
#P-110	Probe, freq counter or scope use, 1X, 10X. 200 MHZ scope use.	39.00

NEED MORE INFO - CALL
HAL MANDERY- KK4UN
SALES ENGINEER

ORDERS ONLY - TOLL FREE
800-638-8050

INFORMATION (305) 561-2211

MasterCard VISA DISCOVER

STARTEK INTERNATIONAL INC
398 NE 38th ST., FT. LAUDERDALE, FL 33334
FAX (305) 561-9133

TERMS: Shipping-handling charges for Florida add $4 + tax, US & Canada add 5% ($4 min, $8 max), all others add 10% of total. COD fee $3.75. Payment by VISA, MC, DISCOVER, COD for CASH or MO. Prices and specifications are subject to change without notice.

CIRCLE 247 ON READER SERVICE CARD

Software for the Ham Shack, Part IV

Useful ham calculations you can program yourself!

by Bill Clarke WA4BLC

This is the fourth, and last, part of this series of articles. The Ham System has grown to be quite capable of saving time and aggravation for the user.

Let's add the last modules to the system. This month the MAIN MENU will grow to nine choices. Added will be:

8 - RESISTOR COLORS TO OHMS
9 - AIR COIL INDUCTANCE

Module Eight

Last month, you added module seven, which gives you the resistor color codes when you enter the value of ohms required. This month, with module eight, you get to do the reverse: Enter the color codes and get the value in ohms.

Module Nine

Have you ever looked in the junk box and come up with an air-wound coil of unknown value? This last module asks for the physical dimensions of the coil, then gives you its value in microhenries. No more unknown coils!

Entering the Listing

Before you add program lines from this month's listing, you must first LOAD "HAM3". After it is loaded, LIST it. Then you are ready to start typing in the new material.

After you have completed typing in all the lines, save it under the name HAM4.

Using the New Program

LOAD the new program by typing LOAD "HAM4" and pressing ENTER. When the computer signals READY on the screen, type RUN and press ENTER.

The next thing you should see is the MAIN MENU for your new Ham System. It should show nine selections: ANTENNA DESIGN MATH, TRANSMISSION LINE MATH, OHM'S LAW, POWER FORMULAS, EFFICIENCY FORMULA, RADIO HORIZONS, OHMS TO RESISTOR COLORS, RESISTOR COLORS TO OHMS, and AIR COIL INDUCTANCE.

Clone users, put GWBASIC on a disk and add this handy batch file to start your system: At the DOS prompt type:

```
A> COPY CON HAM4.BAT
   ECHO OFF
   CLS
   GWBASIC HAM4
   (function key F6)
```

Press ENTER after each line.

C-64 Modifications

C-64 users remember the modifications listed in Part 1 of this series and the following:

Replace the listed lines as follows:

```
810 INPUT "FIRST BAND COLOR ";F$
811 INPUT "SECOND BAND COLOR";S$
812 INPUT "THIRD BAND COLOR ";T$
831 PRINT "THE  RESISTOR VALUE IS:"
832 PRINT F$S$T$" OHMS"
910 INPUT "DIAMETER IN INCHES: ";D
911 INPUT "LENGHT IN INCHES:   ";L
912 INPUT "NUMBER OF TURNS:    ";N
921 PRINT "INDUCTANCE = "FNA(L)" MICRO HENRYS"
```

HAM4 Listing

```
21 PRINT SPACE$(26);"8 - COLOR CODES TO OHMS"
22 PRINT SPACE$(26);"9 - AIR COIL INDUCTANCE"
39 IF M$ = "8" THEN 800
40 IF M$ = "9" THEN 900
800 CLEAR : CLS
801 PRINT SPACE$(25);"RESISTOR COLOR CODES"
802 PRINT SPACE$(20);"----------------------------"
803 PRINT : PRINT : PRINT
810 INPUT "ENTER THE COLOR OF THE FIRST BAND ";F$
811 INPUT "ENTER THE COLOR OF THE SECOND BAND";S$
812 INPUT "ENTER THE COLOR OF THE THIRD BAND ";T$
820 X$ = F$
821 GOSUB 850
822 F$ = A$
823 X$ = S$
824 GOSUB 850
825 S$ = A$
826 X$ = T$
827 GOSUB 870
828 T$ = A$
830 PRINT : PRINT : PRINT
831 PRINT "THE RESISTOR VALUE IS: "F$S$T$" OHMS"
832 PRINT
840 PRINT "N - TRY AGAIN"
841 PRINT "M - MAIN MENU"
842 M$ = INKEY$
843 IF M$ = "N" THEN 800
844 IF M$ = "M" THEN 10
845 GOTO 842
850 IF X$ = "BLACK" THEN A$ = "0"
851 IF X$ = "BROWN" THEN A$ = "1"
852 IF X$ = "RED" THEN A$ = "2"
853 IF X$ = "ORANGE" THEN A$ = "3"
854 IF X$ = "YELLOW" THEN A$ = "4"
855 IF X$ = "GREEN" THEN A$ = "5"
856 IF X$ = "BLUE" THEN A$ = "6"
857 IF X$ = "VIOLET" THEN A$ = "7"
858 IF X$ = "GRAY" THEN A$ = "8"
859 IF X$ = "WHITE" THEN A$ = "9"
860 RETURN
870 IF X$ = "BLACK" THEN A$ = ""
871 IF X$ = "BROWN" THEN A$ = "0"
872 IF X$ = "RED" THEN A$ = "00"
873 IF X$ = "ORANGE" THEN A$ = ",000"
```

Continued on page 36

Radio Fun

If you were one of the smart ones, your subscription to *Radio Fun* began with the premier summer issue. If you waited, you're too late. The premier issue sold out in three weeks.

Radio Fun is packed full of information to help you get more fun out of amateur radio. Basic "how-to" articles will get you up and running on packet, ATV, RTTY, DXing, and the dozens of other activities that make amateur radio such a great hobby. You'll get equipment reviews geared toward the newcomer, letting you know how to get the most out of your new or used gear. We'll help you upgrade to a higher class license with monthly columns designed to teach you what you need to know in a fun and exciting way. We'll answer your questions on hundreds of things—how to check into a new repeater—how to build a QRP transmitter—how to get on the ham sattelites—how to fix that broken rig—how a transistor works—You'll find it all, and more, in the pages of *Radio Fun*.

Monthly publication begins with the September issue, so don't wait another minute. Subscribe today and you still get the charter subscription rate of only $9.97 for one year (though we can't guarantee that price for much longer). That's 12 issues of the only ham radio magazine that is geared especially for the newcomer, or any ham who wants to get more fun and excitement out of amateur radio—*Radio Fun*!

Get more fun out of radio with *Radio Fun*.

1 year—$9.97
Charter Subscription Rate

1-800-722-7790

☐ YES! Sign me up right now! 12 issues of *Radio Fun* for $9.97.

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

MC ___ Visa ___ Amex ___ Check ___ $10 cash ___ MO ___

CARD # _____ EXPIRES _____

Class License _____ Year licensed _____ *73* Subscriber _____

QST subscriber _____ *CQ* Subscriber _____

Mail to: *Radio Fun;* Forest Rd. Hancock, NH 03449
[Yes, you can call it in via 800-722-7790 or fax it to 603-525-4423]

Canada add $7.00 plus .70 GST. Foreign add $12.00 surface, $36.00 airmail. Newsstand Rate $18.00. Basic Subscription Rate $14.97.
Monthly publication begins 9/91.

02H

73 Review *by Bill Brown WB8ELK*

The TAPR METCON-1 Kit

Add telemetry and control to your packet station.

Tucson Amateur Packet Radio (TAPR)
P.O. Box 12925
Tucson AZ 85732-2925
Tel. (602) 749–9479
FAX: (602) 749–5636
Price Class: Main Board, $85;
V-to-F Converter, $25; Temperature Board, $30.

How would you like to have the ability to read sensors or control circuitry from a remote location via packet radio? Thanks to a new kit from the folks at TAPR (Tucson Amateur Packet Radio), it's now easy to take full advantage of advanced packet control.

Packet Telemetry

The METCON-1 kit (TeleMETry CONtrol) is a versatile telemetry/control unit that uses a serial port for communications. You can send commands to the METCON-1 board via a computer serial port, telephone modem or a packet TNC.

The METCON-1 board simply hooks up between a packet TNC's serial port and the circuits you want to control or sense.

One of the most obvious uses for the METCON-1 board would be in a remote repeater installation. Useful information such as building temperature, amplifier temperature, backup battery voltage, and AC power status can be easily sent back at fixed intervals (or upon a connect request). You can also use the METCON-1 to turn on transmitters, lights, amplifiers, antennas, and just about anything else that can be activated by a relay.

The METCON-1 board also looks at the status of binary inputs. Whenever it detects a change in one of these lines it automatically sends out a status message. I use this feature as an intruder alert in my installation. I hooked up the METCON-1 to a micro-switch that closes whenever anyone opens the hamshack door! Since the METCON-1 has a built-in clock, it actually sends me a timestamp of the event (I know exactly when the door was opened!). Not only can the unit detect "On/Off" transitions on its six inputs, it can measure frequency as well (0 to 10 kHz).

Kit Assembly

The kit comes complete with all components as well as a high quality doubled-sided PC board. An optional voltage-to-frequency interface board is also available. Component placement is well-marked and silk-screened onto each board to make assembly a real breeze.

Construction was quite straightforward and went easily. The assembly instructions were excellent, with every step spelled out in detail. The checklist format helps ensure that you don't miss a step or component. Since this is a double-sided board with plated through-holes, it's important to take care in assembly. Removing components from a double-sided board could be difficult.

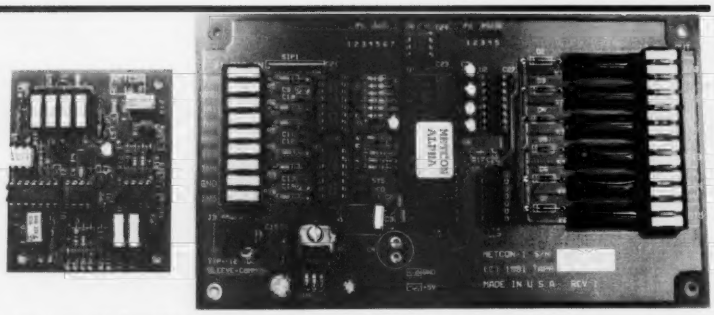


Photo. The assembled TAPR METCON-1 telemetry and control unit. The smaller PC board to the left is the optional V-to-F interface board.

Sockets are provided for all ICs. I particularly like the connectors used for interfacing to the outside world. You just slide a wire into the hole and hold it in place with a snap lever (no soldering!). This scheme also makes it easy to quickly change your external wiring (particularly useful when you're at a remote repeater site).

Installation

The METCON-1 board communicates via its serial port. You can use a telephone modem, computer serial port, or a packet TNC to send commands and receive data. In a typical packet hookup, you just connect the METCON-1 to your packet TNC's serial port and hook up the items you want to control to any of the six onboard relays. The six inputs to the METCON board can be used as "On/Off" detectors. These inputs can also function as a frequency counter which allows use of a voltage-to-frequency interface board.

The V-to-F Interface

Through the use of the optional V-to-F (voltage to frequency) board, sensors can be interfaced to the METCON-1. Any device that outputs a voltage between 0 to 10 volts (when configured for low input range) or 0 to 100 volts (high input range) can be measured. You can also configure the V-to-F board to function as a temperature sensor. Each V-to-F board hooks up to one of the input ports of the METCON-1 board. You just read out the frequency on the main memory map output. In the case of voltage, just divide the frequency by 10. To get temperature readings you must divide by 10 and then subtract 100.

The voltage-to-frequency scheme has some intriguing advantages over traditional A-to-D (analog to digital) converters. Since the voltage level is converted to a frequency directly at the source, it doesn't suffer from voltage drops or noise when using long wire leads from a sensor. The drawback to this method is that it takes a full second for each sample (each channel). For most applications this is more than sufficient. However, you can plug an optional ADC (analog-to-digital converter) directly into the METCON board if you desire. The ADC board is a future option that is not currently available.

Operation

Commands to the METCON-1 are performed in individually addressed bits or bytes. Each area of the METCON's memory contain specific locations for input and output status, frequency counter output, system configuration and A/D conversions. You can display a memory location, write to it or reset it. All commands are preceded by an "=" sign and a METCON station address (in case you have more than one METCON board in your system—The default address is "A").

```
-A- SUN/910624/0556/00 AUTO TIMEOUT FOR MEMORY DISPLAY

    P6          P5          P4          P2          P0
0000 0000   0000 0000   0000 0000   0000 0001   0000 0000   OUT   (08 07 06 05 04)
0000 0000   0000 0000   0000 0000   0000 0001   1101 1110   IN    (0D 0C 0B 0A 09)
0000 0000   0000 0000   0000 0000   0000 0001   1111 1111   CHG   (12 11 10 0F 0E)

  7      6      5      4      3      2      1      0
00000  00000  00000  00000  00000  00000  00000  01253  FREQ CTRS

  7    6    5    4    3    2    1    0
255  255  255  255  255  255  255  255  ADC

-A- MEMORY DISPLAY COMPLETE
```

Figure 1. The METCON-1 memory map can be sent out every 15 minutes (or every minute) for testing. Output port P2 shows that relay 0 is activated, input port P0 shows a closed circuit on input 6 and the frequency counter indicates a temperature of 25.3°C.

Catch of the day!

Have you been trawling the bounding main for a new product? We have just netted it—the TP-38 microprocessor controlled community repeater panel which provides the complete interface between the repeater receiver and transmitter. Scuttle individual tone cards, all 38 EIA standard CTCSS tones are included as well as time and hit accumulators, programmable timers, tone translation, and AC power supply at one low price of $595.00. The TP-38 is packed like a can of sardines with features, as a matter of fact the only additional option is a DTMF module for $59.95. This module allows complete offsite remote control of all TP-38 functions, including adding new customers or deleting poor paying ones, over the repeater receiver channel.

$595.00 each
$59.95 DTMF module
$149.95 Digital CTCSS module

Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.

Now available with Digital CTCSS

COMMUNICATIONS SPECIALISTS, INC.
426 West Taft Avenue • Orange, CA 92665-4296
Local (714) 998-3021 • FAX (714) 974-3420
Entire U.S.A. 1-800-854-0547

MasterCard VISA

CIRCLE 10 ON READER SERVICE CARD

SATELLITE CITY
Communications for the Future

DAN KB0XC—KIRBY KA0ZTS—LOUIS KA0IPN
RON N0KMR—DENISE YL—MALINE XYL—MIKE S00N

1-800-426-2891

YAESU

LIST

FT-767 GX Gen. Cvg Xcv	2299.00	Call $
FT-757 GX II Gen. Cvg Xc	12[illegible].00	Call $
FT-7000 15m-160m AMF	[illegible].00	Call $
FT-212RH NE[illegible] 45w	[illegible].00	Call $
FT-712RH 70cm		Call $
FT-290R All Mode		Call $
FT-23 R/T		Call $
FT-736R, All		Call $
FT-470 2m/70cm		Call $
FT-747 Gen'l		Call $
FRG 8800 H		Call $
FRG 9600 UHF Rcv		Call $
FT 690 R/H		Call $
FT 790 R/H	[illegible]0	Call $
FT 4700 Dual Band Mo[illegible]e	[illegible]0	Call $
FT 411 2 Meter HT	40[illegible].0	Call $
FT 811 440 HT	410.00	Call $

Yaesu New FT-990 HF All-Mode

ICOM

LIST

IC-781 New Deluxe H[illegible] Rig	6149.00	Call $
IC-765 Gen. Cv[illegible] Xcvr	3149.95	Call $
IC-735 Gen. Cv[illegible]	11[illegible]	Call $
IC-751A Gen. Cv[illegible]	[illegible]0	Call $
IC-R[illegible] 95 120	[illegible].00	Call $
IC-R71A	[illegible]	Call $
IC-228A/H[illegible]	[illegible]	Call $
IC-28A/H[illegible]	[illegible]99	Call $
IC-2[illegible]	[illegible]	Call $
IC-900 Six	[illegible]	Call $
IC-3S AT	[illegible].00	Call $
IC-2S A[illegible]	[illegible]0	Call $
IC-4S AT	[illegible]	Call $
IC-48A FM Mobile 2[illegible]	[illegible]9.00	Call $
IC-4GAT New 6w H[illegible]	[illegible]9.95	Call $
IC-38A 25w FM Xcv	489.00	Call $
IC-32AT 2m/70cm H[illegible]	629.95	Call $

ICOM Blow Out! IC-2SA

NOW

cushcraft CORPORATION

R. F. Concepts	Larsen
Astron	Hustler
Butternut	Lakeview
ARRL	AEA
Kantronics	MFJ
Sony	Cushcraft
Bencher	Vibroplex
KLM/Mirage	

Plus more . . . Thanks for your support.

NOW CANADA

1-800-426-2891
METRO: (612) 786-4475
2663 County Rd. I
Mounds View, MN 55112
Super Minnesota Watts 1-800-279-1503

CIRCLE 153 ON READER SERVICE CARD

METCON-1 KIT

Continued from page 34

For example: The memory address for the six relay outputs is location number 05. To turn on relay 1, you send the command "=AS050". The "S" is the set command, the "05" is the memory address, and the "0" is the relay number. To turn off the relay, you just need to send the clear command: "=AC050". If you want to look at the memory location, the command is "=AD050" ("D" for display). That's really all there is to it. If you want to turn on or off several relays, you can send a byte write command that sets all of the control bits in one operation. Example: "=AWY050F" turns on relays 0,1,2 and 3 simultaneously, since the "0F" address sets the lower 4 bits "On".

For repeater or remote base control, the password feature adds a level of security. You can set up certain portions of memory as restricted. In this mode, you need to logon to the METCON-1 with a password in order to perform control operations.

Impressions

I have the METCON-1 installed in the W2NSD/1 hamshack. It's hooked up to a 10 meter CW beacon transmitter, a low-power 2m FM transmitter, an ATV transmitter, a TV camera, and lights. Whenever I want a signal source on ATV, 10 or 2 meters, I just connect up on packet and have a blast turning the equipment on and off remotely. I use the inputs to measure the shack temperature as well as to indicate when the shack door is opened.

Sure, I could've done part of this with a touch-tone decoder, but the METCON-1 system allows me to control things error-free, as well as provide real-time telemetry.

The review unit was the preliminary version of METCON-1 (Alpha Test). I found the assembly instructions to be very complete and easy to follow. For those of you with the preliminary manual, you may have to dig around a bit to understand how all of the commands work, however. Once you figure out how the memory addresses are configured, you'll be well on your way to controlling things.

To some extent, you do have to decipher the values presented to you in the memory map. The METCON-1 board won't come right out and tell you "The Temperature is:" or "Battery voltage =." Once you have figured out the memory map, you can easily read your system's status.

For those hardware and software hackers out there, there is room to add a substantial amount of I/O capability to this system. There is provision for a fast upload and download of the system memory. You could write a program to display this information in graphics form for a really spectacular display in an easy-to-read format.

The METCON-1 system is a powerful and economical tool for anyone considering remote control applications. You'll probably wonder how you got along without it! 73

Hamshack Software

Continued from page 32

Listing continued

```
874 IF X$ = "YELLOW" THEN A$ = "0,000"
875 IF X$ = "GREEN" THEN A$ = "00,000"
876 IF X$ = "BLUE" THEN A$ = ",000,000"
877 IF X$ = "VIOLET" THEN A$ = "0,000,000"
878 RETURN
900 CLEAR : CLS
901 PRINT SPACE$(26);"AIR COIL INDUCTANCE"
902 PRINT SPACE$(20);"----------------------------"
903 PRINT : PRINT : PRINT
910 INPUT "ENTER THE COIL DIAMETER IN INCHES: ";D
911 INPUT "ENTER THE COIL LENGTH IN INCHES:   ";L
912 INPUT "ENTER THE NUMBER OF TURNS OF COIL: ";N
915 A = (D*D)*(N*N)
916 B = (18*D)+(40*L)
917 L = A/B
918 GOSUB 390
920 PRINT
921 PRINT "THE INDUCTANCE IS: "FNA(L)" MICRO HENRYS"
930 PRINT
931 PRINT "N - TRY AGAIN"
932 PRINT "M - MAIN MENU"
933 M$ = INKEY$
934 IF M$ = "N" THEN 900
935 IF M$ = "M" THEN 10
936 GOTO 933
```

When you want to use HAM4, just place the disk into the drive and type "HAM4", then press ENTER. GWBASIC will execute, and HAM4 will load and run. The bottom light bar will be extinguished, leaving a very professional appearing menu.

Comments

The system has grown over the past few months. I sincerely hope you find it as useful as I found it fun to write. If you would like for the system to grow more, write me. I would consider doing an update from time to time.

For readers not wishing to type in the many lines of program code that have appeared in this series, I will make copies. The cost is $5, which includes the disk, copying, and shipping. SPECIFY CLONE OR C-64. Write to me at the address below. Also, each module as well as the complete program can be downloaded from the *73* BBS at (603) 525-4438. Look for the listings under the *73mag* SIG. 73

You may write Bill Clarke WA4BLC at RD#2 Box 455-A, Altamont NY 12009. Please enclose an SASE for a reply.

THE JAPAN RADIO CO.

NRD-535

THE NEXT GENERATION IN HIGH-PERFORMANCE HF RECEIVERS

Once again JRC breaks new ground in shortwave receiver design. The new NRD-535 has all the features SWLs and amateurs have been waiting for. General coverage from 0.1 to 30 MHz in AM, USB, LSB, CW, RTTY, FAX and Narrow FM modes. Advanced ECSS operation for phase-lock AM reception. Variable bandwidth control (BWC). Tuning accuracy to 1 Hz possible with direct digital synthesis. 200 memory channels with scan and sweep operation. Triple Superheterodyne receiving system. Superb sensitivity, selectivity and image rejection. Dual-width noise blanker eliminates impulse noise. Squelch, RF Gain, Attenuator, AGC and Tone controls. Optional RTTY demodulator available. 24 hour clock/timer. Easy to read vacuum fluorescent display with digital S-meter. AC and DC operation. Plus the most comprehensive computer interface found on any radio to date. Call or write today for a full color brochure, price list and dealer information.

JRC *Japan Radio Co., Ltd.*

MAIN OFFICE: Akasaka Twin Tower (Main), Akasaka 2-chome, Minato-ku, Tokyo 107, JAPAN
Tel.: (03) 584-8836 Telex: 242-5420 JRCTOK J

IN U.S.A.: 430 Park Avenue (2nd Floor), New York, NY 10022
Tel.: (212) 355-1180 FAX: (212) 319-5227 Telex: 961114 JAPAN RADIO NYK

Universal CAT Interface

Control your rig with your computer!

by Art Harding K5YEF

Many of us got excited in the early '80s when microprocessor radios appeared on the market. This heralded the beginning of the patching together—"interfacing"—of personal computers and amateur radio equipment. This offered the promise of menu-driven radio operation, vastly increased and enhanced memory, complete rig status display on the computer monitor—and the imagination went wild.

But there is a hitch—many computers and microprocessor rigs can't "talk" to each other directly. Most rigs want to converse with Transistor-Transistor Logic (TTL) bit transfer levels between 0 and +5 volts, but most of our computers demand that the digital dialogue go along RS-232C levels, which are from −12 to +12 volts. Commercial interface units mean more bucks, and, well, someday maybe we'll get around to creating one. And so for many of us, the rig and the computer remained separate. *[Ed. Note: Many modern rigs have a computer control port. They are known as Computer Accessed Transceivers (CAT)].*

Birth Of The Project

For me, "someday" finally came. After operating Yaesu's FT-980 HF radio for several years, the itch for CPU control got too strong, and I set forth to design and build the interface.

What follows is a solution, not just for the IBM and FT-980, but for any computer with an RS-232 serial port and a CPU radio with a TTL port. You can keep it simple on a breadboard or you can build up a permanent black box for full-time operation.

Digital Transfer

Figure 1a shows a random RS-232 waveform coming from a computer's serial port. The waveform needs to be converted to TTL levels for the radio. Note that the signal is inverted at the TTL port from whence it came. It could have been left in phase, and the software signals programmed to make 1's into 0's and vice versa. But this step can be eliminated by the hardware, and that's the course I took, preferring to keep the software simple.

In Figure 1b, the reverse takes place. Many radios send back command echoes, confirmation and status signals, for the computer to process. Again, an inverting action is desirable.

Refer to Figure 2, a portion of the FT-980 schematic for the CPU section. Note that any interface circuit must deliver its output data

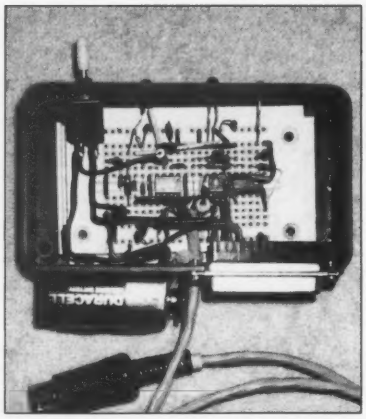


Photo A. The components were mounted on an Experimenters Socket which fits neatly into a case available from Radio Shack (no soldering!).

Photo B. The CAT980 program display. This full-featured program is available from the author as shareware (see the Parts List for details).

stream into a load of at least 165 ohms (330/2)! However, the serial data stream out of the radio is a stiff NPN switch, a nice signal to work with.

I could not get my hands on all microprocessor-controlled radios, of course, but on-the-air surveys indicated that the FT-980 radio is a good test bed for circuit development for other CPU radios on today's market. So, even if you're not dealing with this specific configuration, it's worth it to read on!

A Simple Interface Circuit

The result is the circuit shown in Figure 3. An old friend, U1, an LM324 quad op amp, does the job with two of its amps still unused. U1a acts as an inverting, saturating differential voltage comparator with a Schmitt trigger personality, and U1b does the same thing in the reverse direction.

They are not identical circuits, however. U1b drives the TTL input to the radio, the low 165 ohm load mentioned above. The idea is to only draw serious power when the negative going or "ground" level pulses occur. As the RS-232 pulse from the computer goes positive on pin 2 of the input connector, the output is driven negative through R7 and D2. D3 clamps the pulse so that it just stays above ground level, yet low enough to be read as a zero TTL signal. The negative input pulses, or static state (no commands being sent to the radio), draw minimum current from the power source.

U1a doesn't have quite the demand on it to perform its function of converting TTL signals from the radio to the computer. R1 was originally 18k during software development, and that value seems to work fine for IBM and compatibles. When I used a laptop, I found more drive was needed. I settled on a value of 3.3k, which has worked with all computers used to date.

Figure 3 shows you all that you will need to breadboard a no-frills interface in order to try some of your programming ideas. You can easily put it all on a Radio Shack Experimenter Socket (RS 276-175), and use cable ties to hold down the interconnecting cables to the breadboard. *[Ed. Note: The Radio Shack prototype board is an excellent way to quickly build circuits without any soldering.]* I used this circuit for eight months during

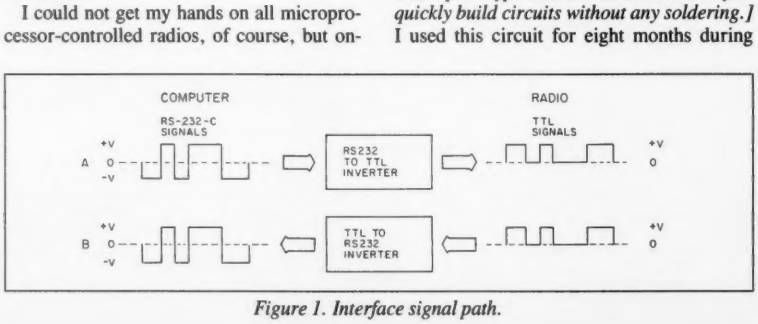


Figure 1. Interface signal path.

If you always thought a microprocessor-controlled repeater had to be expensive, LOOK AGAIN! You could easily spend this much just for a controller.

REP-200 REPEATER

A premium repeater with autopatch and many versatile dtmf control features at *less than many charge for a bare-bones repeater!*

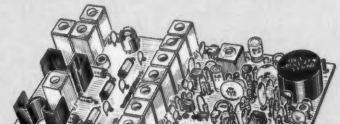
We don't skimp on rf modules, either! Check the features on R144 Receiver, for instance: GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

Kit $1095; w/t only $1295!

- Available for the 2M, 220MHz, 440MHz, 902MHz bands. ***FCC type accepted** (vhf and uhf commercial bands).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power output 15-18W (25W option) on 2M or hi-band; 15W on 220MHz; 10W on uhf or 902MHz.
- Accessory add-on PA's available with **power levels up to 100W.**
- **Six courtesy beep types**, including two pleasant, sequential, multi-tone bursts.
- **AUTOPATCH**: either **open or closed** access, **toll-call restrict**, auto-disconnect.
- **Reverse Autopatch**, two types: auto-answer or ring tone on the air.
- **DTMF CONTROL**: over 45 functions can be controlled by touch-tone. Separate 4-digit control code for each function, plus extra **4-digit owner password.**
- **Owner can inhibit** autopatch or repeater, enable either open- or closed-access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options, including two auxiliary external circuits.
- The cwid message, dtmf command codes, and owner-specified default parameters for cor and cwid timers and tones are burned into the eprom at the factory.
- Cw speed and tone, courtesy beep and tail timers, and courtesy beep type **can all be changed at any time** by owner-password-protected dtmf commands.
- Many **built-in diagnostic** & testing functions using microprocessor.
- Color coded led's **indicate status** of all major functions.
- **Welded partitions** for exciter, pa, receiver, and controller. PEM nuts hold covers.
- 3-1/2 inch aluminum rack panel, finished in eggshell white and black.
- **Auxiliary receiver input** for independent control or **cross linking repeaters.**

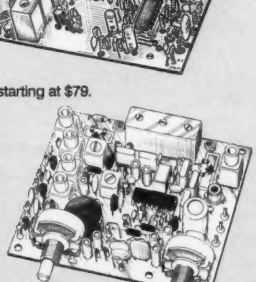
REP-200V Economy Repeater Kit. As above, except uses COR-4 Controller without DTMF control or autopatch. **Kit only $795.**

HIGH PERFORMANCE XMTRS & RCVRS FOR REPEATERS, AF & DIGITAL LINKS, TELEMETRY, ETC.



FM EXCITERS: kits $99, w/t $169. 2W continuous duty. TCXO & xtal oven options available. *FCC type accepted for com'l uhf & hi bands.*

- **TA51** for 2M, 150-174, 220MHz.
- **TA451** for uhf.
- **TA901** for 902-928MHz, (0.5W out; w/t only).
- **VHF & UHF AMPLIFIERS.** For fm, ssb, atv. Output from 10W to 100W. Several models, kits starting at $79.

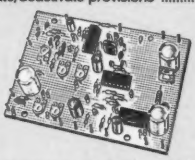


FM RECEIVERS: kits $139, w/t $189.

- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift.
- **R451 UHF FM RCVR,** similar to above
- **R901 902-928MHz FM RCVR.** Triple-conversion, GaAs FET front end.
- **R76 ECONOMY FM RCVR** for 6M, 2M, 220MHz, w/o helical res. or afc. Kits $129.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w/t $189.

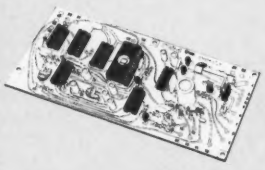
ACCESSORIES

TD-3 SUBAUDIBLE TONE DECODER/ENCODER kit. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions $24

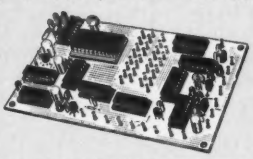


COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

CWID kit. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 .....$59



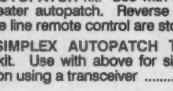
COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call $99



TD-2 TOUCH-TONE DECODER/CONTROLLER kit. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! $79

AP-3 AUTOPATCH kit. Use with above for repeater autopatch. Reverse patch & phone line remote control are std .$79

AP-2 SIMPLEX AUTOPATCH Timing Board kit. Use with above for simplex operation using a transceiver $39



MO-202 FSK DATA MODULATOR kit. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. $39

DE-202 FSK DEMODULATOR kit. For receive end of link. $39

9600 BAUD DIGITAL RF LINKS. Low-cost packet networking system, consisting of new MO-96 Modem and special versions of our 220 or 450 mHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

GaAs FET PREAMPS

at a fraction of the cost of comparable units!

LNG-(*)

ONLY **$59** wired/tested

FEATURES:

- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

LNW-(*) MINIATURE GaAs FET PREAMP

ONLY **$24**/kit, **$39** wired/tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

ONLY **$79**/kit, **$99** wired/tested

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Specify tuning range: 120-175, 200-240, or 400-500 MHz.*

HELICAL RESONATOR PREAMPS

Preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-(*),** $49 vhf, $94 uhf.

**Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-450, 450-470.*

RECEIVING CONVERTERS

Low noise converters to **receive vhf and uhf bands on a 10M receiver.** Choice of kit with case & BNC jacks, kit with pcb only, or w/t unit in a case.

Request catalog for complete listings.

VHF input ranges avail: 136-138, 144-148, 145-147, 146-148; kit less case $39, kit w/case $59, w/t in case $89.

UHF input ranges avail: 432-434, 435-437, 435.5-437.5; kit less case $49, kit w/case $69, w/t in case $99.

TRANSMITTING CONVERTERS

XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 432, 435, and for atv. 1W output.

Kit only $79. PA's up to 45W available.

Request catalog for complete listings.

- **For complete info, call or write for FREE 40-page catalog.**
  Send $2 for overseas air mail. For casual interest, check reader service; allow 3-4 weeks.
- **Order by mail, fax, or phone** (9-12, 1-5 eastern time)
- **Min. $3 S&H charge** for first pound plus add'l weight & ins.
- **Use VISA, Mastercard, check, or UPS C.O.D. ($3 fee).**

OUR 29TH YEAR!

hamtronics, inc.

65 MOUL RD. - HILTON NY 14468-9535

Phone: 716-392-9430 -- FAX: 716-392-9420

Hamtronics is a registered trademark. Copyright 1969, Hamtronics, Inc. All rights reserved.

CIRCLE 57 ON READER SERVICE CARD

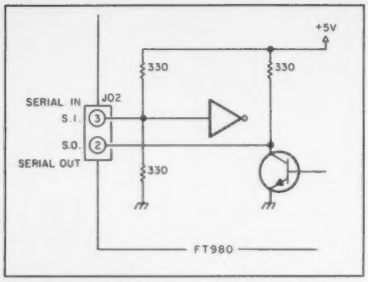


Figure 2. FT-980 CAT typical port circuit (part of the radio).

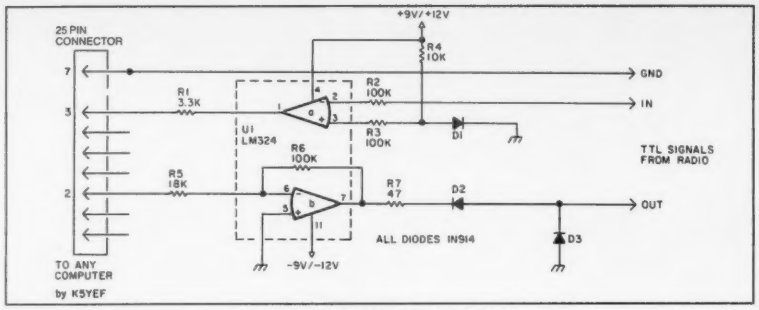


Figure 3. Simple CAT interface.

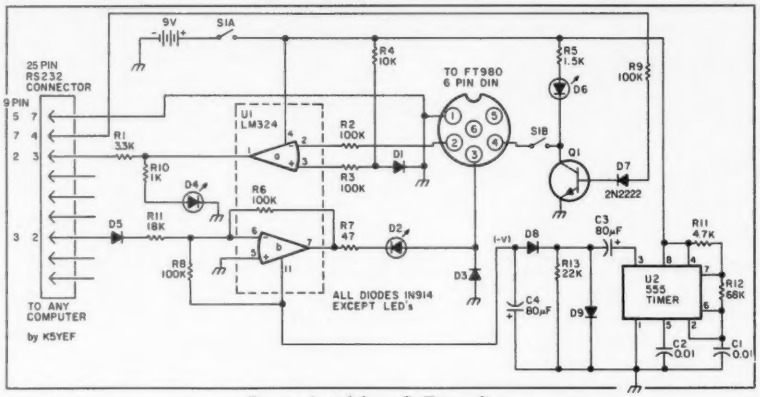


Figure 4. A deluxe CAT interface.

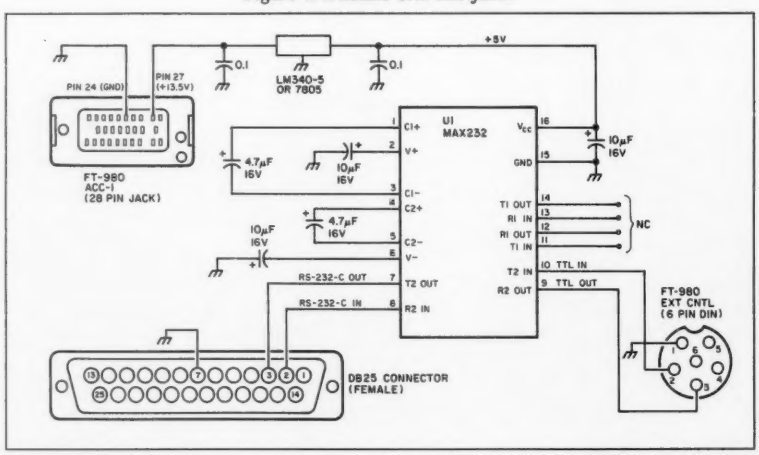


Figure 5. An alternative interface circuit that simplifies the circuitry. Thanks to M.G.D. Vermeulen ZS1HQ for this design.

software development, with a power source of two 9 V batteries, which I switched in and out as needed.

A Deluxe Interface

When the last line of code was written (though we who write code know that no such time ever comes!) and a couple of operating months went by, I wanted a permanent black box with only one battery to mess with. Or maybe no battery at all! Figure 4 shows the results. In the final version, I added a number of refinements, which we'll examine.

It seemed most desirable to have a visual handle on the operation of the interface, some lights that showed what was going on. When writing software and dealing with a computer port, the nagging question often is: Did that command go out the port like it was supposed to? By replacing D2 in Figure 3 with an LED, not only is this question put to rest, but the same LED also signals the transition of the command to a TTL level. When serial positive-going pulses output the computer port, D2 will light up as U1B, making the signal negative-ground going.

The addition of R10 and LED D4 serves the same function for inputs to the computer after TTL to RS-232 transition. A new diode, D5, blocks negative RS-232 levels from the computer, yet passes the all-important positive-going levels.

I have added a new circuit consisting of Q1, D6, D7, R5, and R9, to control a radio key line with a computer. I chose the RTS line in the computer port to key the radio. A positive signal on this line saturates Q1 and grounds pin 4 of the 6-pin DIN radio connector that keys the rig. Note that D6 is also an LED, so the operator has a visual on-the-air light. This is optional, but the odds are you're also going to want to key your radio from the keyboard. You may wish to omit this portion of the interface if you plan to key the radio as you normally do, such as for VOX operation.

The last enhancement, shown in Figure 4, is a negative voltage supply for the interface, so that you need only one battery or positive supply voltage. This simple circuit has been around in various forms over the years. U2, a 555 timer, oscillates around 1 to 2 kHz at the output of pin 3 on the chip. The network consisting of D8, D9 C3, and C4 comprises a full-wave rectifier circuit to take the place of an external negative supply. You may wish to eliminate the battery and use a 9 V supply, perhaps by bringing in a +9 V to +12 V line from the radio itself.

An on/off switch completes the interface. It seemed wise to use one section of the switch to disconnect the key line from the interface when it was not in use. If you do bring in the power from the radio, you may wish to eliminate the power switch.

Table 1. 6-Pin Signal Assignments

6-Pin Din	Signal
1	GND
2	TTL signal from radio
3	TTL signal to radio
4	Key line

Construction of the Interface

The parts list contains the few components you will need to get the simple or permanent interface operational. Both of them use the Radio Shack Experimenter Socket, which fits snugly down into the Radio Shack Deluxe Project Case.

Well, it almost fits. It's certainly tight enough; no hardware is required to keep it in place. I chose to view this as a blessing, not an "Oh no!" If you wish, you can easily drill the plastic case to mount the LEDs and the power switch. I used the faithful nibbler tool to eat out a three-sided hole in the back panel to mount the RS-232 male connector. The cable from the radio was brought in through a back

GO WITH THE WORLD LEADER!

The WB2OPA LogMaster

HF Logging System

DX PacketCluster Support!

- Unparallelled Log Statistics.
- Auto QSO Alert Indicator.
- Auto Beam Headings.
- Auto Country, Prefix, and Zone Selections.
- Print Log Sheets, QSL Cards, and QSL Labels.
- Dual Clock Calendar.
- User Configurable.
- Search and Sort on Call Sign, Date Prefix, Country, State, CQ Zone, ITU Zone, or User Defined Fields.
- IBM Compatible.
- AND MUCH, MUCH MORE!!!

Just $69.95 Complete.

(New Jersey Residents Please Include Sales Tax)

30 Day Money Back Guarantee

FREE DEMO DISK (Include $5.00 for P & H)

Send Call and Disk Size (5.25 or 3.5) to:

Sensible Solutions

P.O. Box 474

Middletown, New Jersey 07748

(908) 495-5066

Professional Software For The Radio Amateur

CIRCLE 95 ON READER SERVICE CARD

HIGH PERFORMANCE AND GOOD LOOKS!

Tripp Lite's New PR Series DC Power Supplies Complement Your Equipment

With Tripp Lite's DC Power Supplies, you get *affordable* good looks and high performance features like crowbar protection, excellent regulation and line noise isolation. According to *73 Magazine*, it's performance that "never misses a beat."

Tripp Lite also makes a complete line of power protection products for your microprocessor-based radios and computers, including ISOBAR® Surge Suppressors, Line Conditioners and UPS Systems.

TRIPP LITE EST 1922

"THE POWER PEOPLE"

500 N. Orleans, Chicago, IL 60610-4188

(312) 329-1777 • FAX (312) 644-6505

CIRCLE 255 ON READER SERVICE CARD

BATTERIES "R" US . . .

You've bought our replacement batteries before...

NOW YOU CAN BUY DIRECT FROM US, THE MANUFACTURER!

ICOM

CM2, PB2 7.2v @ 500 MAH

CM5, PB5 10.8v @ 500 MAH

SUPER

7S 13.2v @ 1200 MAH $63.95

8S 9.6v @ 1200 MAH $59.95

(base charge only–1" longer)

ICOM CHARGERS AVAILABLE

SPECIAL

REPLACEMENT CHARGER FOR ICOM BC-72

OUR CHARGER FOR THIS MONTH AND THIS MONTH ONLY $65.00

LOOK FOR SEPTEMBER'S SPECIAL OF THE MONTH

CUSTOM MADE BATTERY PACK & INSERTS

Made to your Specifications.

INTRODUCTORY OFFER!

KENWOOD INSERTS

PB-25—$20.00, PB-21—$13.75

PB-26—$20.00

ICOM INSERTS

BP-5—$23.00 BP-3—$17.45,

BP-7, BP-8

Prices subject to change without notice.

MasterCard and Visa cards accepted. NYS residents add 8¼% sales tax. Add $4.00 for postage and handling.

SOURCE FOR ALL YOUR COMMUNICATION BATTERY REPLACEMENT NEEDS.

W & W ASSOCIATES

29-11 Parsons Boulevard, Flushing, N.Y. 11354

WORLD WIDE DISTRIBUTORSHIPS AVAILABLE. PLEASE INQUIRE

In U.S. & Canada Call Toll Free (800) 221-0732 • IN NYS (718) 961-2103 • Telex: 51060 16795 • FAX: (718) 461-1972

MADE IN THE U.S.A.

SEND FOR FREE CATALOG AND PRICE LIST

Circle 191 on reader service card.

NextDay QSLs
Two-Color Rainbow Assortment
Call Today &
Baraboo, Wisconsin
Sauk County
K9ZZ
Info $1
AntennasWest
(801) 373-8425

	We Ship	NextDay	2nd Day	ASAP
	100	$29.95	$24.95	$19.95
	200	$39.95	$34.95	$29.95
	400	$49.95	$44.95	$39.95
	500	$54.95	$49.95	$44.95
	1000	$99.95	$89.95	$79.95

All orders ppd 2nd day air / priority mail.
For overnight air delivery add $10.
Box 50062-S, Provo UT 84605

CIRCLE 5 ON READER SERVICE CARD

SMILE... YOU'RE NOT ON TV...
CALL 1-800-KILL-TVI
TO ORDER
RFI FILTERS THAT REALLY WORK
BX-2S Screws On to tv/vcr input
Now used by FCC during investigations

TP-12 KW-1 BX-2P

The World Famous BX cable-TV filter $24.95
TP-12 Effective standard telephone filter .. $16.95

30 DAY RETURN-FOR-REFUND GUARANTEE

Replace Unfilterable Electronic Telephones With Our NEW TP-XL Filtered Touch-Tone Telephone ... $49.95.
Prices subject to change without notice.
Shipping and handling extra.

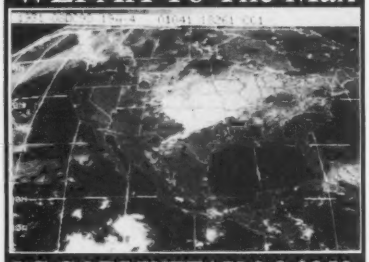
800 number for orders only...
For engineering help, (512) 599-9420
or (512) 656-3635

Tom Coffee, W4PSC (R & D Eng.)

TCE LABORATORIES
14309 Toepperwein Suite 204
San Antonio, Texas 78233
DEALER INQUIRIES ARE NOW INVITED

CIRCLE 87 ON READER SERVICE CARD

WEFAX To The Max



PC GOES/WEFAX 3.0 $250

PC GOES/WEFAX 3.0 is a professional fax reception system for the IBM PC. It includes an AM/FM demodulator, software, cassette tutorial and 325 page manaul. Check this partial list of our advanced features:

Res. up to 1280x800x256 APT Lat/Lon. Grids
Unattended Operation Orbital Predcition
Colorization Frame Looping
Zoom, Pan, Rotation PCX & GIF Export
Contrast Control Grayscale Printing
Tuning Oscilloscope Infrared Analysis
Photometry/Histograms Variable IOC & LPM

PC HF FACSIMILE 5.0 $99

PC HF Facsimile 5.0 is a complete shortwave FSK fax system for the IBM PC. It includes an FSK Demodulator, software, 250 page manual and tutorial cassette. Call or write for a complete catalog of products.

Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
Tel:(714)498-5784 Fax:(714)498-0568

CIRCLE 250 ON READER SERVICE CARD

Table 2. Parts List - Deluxe Interface

Part	Description	Part Number
D1,D3,D5,D7,D8,D9	1N914 diodes	RS 276-1122
Q1	2N2222 (or 2N3904) NPN transistor	
U1	LM324	RS 276-1711
U2	555 timer IC	RS 276-723
S1	DPDT switch	RS 276-636
D2,D4,D6	LED	RS 276-1622
R1	3.3k, ¼W resistor	
R2,R3,R6,R8,R9	100k "	
R4	10k "	
R5	1.5k "	
R7	47 ohm "	
R10	1k "	
R11	4.7k "	
R12	68k "	
R13	22k "	
C1,C2	0.01 µF, 15V ceramic capacitor	
C3,C4	80 µF, 15V electrolytic (or substitute 100 µF, 35V,	RS 272-1016)
Packaging		
1	Experimenter socket	RS 276-175
1	Deluxe project case	RS 270-221
1	6-pin din connector*	RS 274-021
1	DB-25 Subminiature female connector	RS 276-1429

*For FT-980 only. Use radio connector shown in your manual.

Alternative Interface (see Figure 5.)

Qty.	Description	Part Number
1	MAX232 (or ICL232)	Digi-Key ICL232
1	7805 voltage regulator	
3	10 µF, 16V electrolytic (or tantalum) capacitor	
2	4.7 µF, 16V electrolytic (or tantalum) capacitor	
2	0.1 µF ceramic capacitor	
1	DB-25 female connector	RS 276-1429
1	6-pin DIN connector	RS 274-021
1	28-pin accessory jack for FT-980	Yaesu

CAT980 - Shareware for IBM & FT-980

300 New Memories	Three Scanners
Uses Your Menus	Analog Dials
Dual Local/Zulu Clock	Displays Filter Bandpass
Status Info Displays	Easy Split Operation
Software Keyline	Instant WWV Key and Return

An EXE program in PASCAL, available on CompuServe, or send $5.00 ($20 for full registration) to Art Harding K5YEF, P.O. BOX 861719, Plano TX 75074. Specify 5¼" or 3½" disk.
NOTE: The GW-BASIC program CAT_SEED shown in this article (Figure 5) is included on this disk. The CAT_SEED program is also available from the *73* BBS under the *73MAG* SIG at (603) 525-4438.

panel hole and held in place on the circuit side with a cable tie.

I found a couple of small capacitors at a street sale to use as C3 and C4. Radio Shack equivalents are listed in the parts list, but I suspect their physical size will not be as pleasing to the eye. That's why they make tops to the boxes.

When all was said and done, there was still room on the back panel to mount a 9 V battery with a rubber band passing through two small holes, then tied off.

The 6-pin DIN connector at the end of the cable is shown for operation of an FT-980 only. You may be talking to another radio, so you will have other pin connections and connector. Check your manual and use Table 1 to wire your configuration. The RS-232 connections are the same for all computers, even non-IBMs. Check your serial port manual to make sure this isn't a lie!

Operation

Operation is straightforward. Except for the on/off power switch, it can be unattended. As your program commands the radio, LED D2 will follow the activity. If your radio responds with echo or status information, as does the FT-980, LED D4 will likewise follow the TTL to RS-232 response. LED D6 lights when the radio is keyed either by the computer or by the radio itself.

Most radios require a 4800 baud rate for computer-to-radio communication. Since we're dealing with a saturated amplifier configuration, the baud rate is of no consequence if it stays within reason. "Reason," of course, is some high baud rate where the circuit frequency response can no longer keep up with the transistion time. I don't know of any radio presently available which should cause concern.

One final note about operating: RFI. When you look at the schematics, you can see that I used no bypass capacitors. You may wish to include 0.001 µF caps across all input and output lines. That's fine, but there's a better solution to computer-generated RFI: toriod traps, like Radio Shack's toroid choke RS 273-104, or those offered by MFJ and other manufacturers. No installation is complete at K5YEF without one of these somewhere in the line of the new gadget. I did a four-turn choke using one of these between the interface and the FT-980 without any noticeable increase in birdies when it's on line.

Testing the Interface

Testing is done with the interface not connected to the computer or the radio, but with the interface battery installed. Use a second 9 V battery to connect the negative terminal to pin 7 of the RS-232 interface connector (ground). Be sure to use a 10k resistor in series with the testing battery in the following steps!

Turn the interface on and touch pin 2 of the RS-232 interface connector. LED D2 should light. If you've included the key line circuit, then touch pin 4, and LED D6 should light.

Now disconnect the test battery; you're through with it. Run a wire to pin 7 of the RS-232 interface connector, and short it to pin 2 on the 6-pin DIN connector. LED D4 should light. Be sure to see Table 1 if you are not using a 6-pin DIN for an FT-980 for this test point.

That's it, you're ready. Turn off the interface and put it in line between your radio and computer.

An Alternative

Most of the parts for the simple and deluxe versions of the interface are available from your neighborhood Radio Shack store. However, if you can obtain a MAX232 IC, a smaller version of the CAT interface can be built. M.G.D. Vermeulen ZS1HQ came up with this design which also takes power directly from the FT-980 accessory socket (no battery needed). If you have difficulty finding the MAX232, you can replace it with a Harris ICL232. The ICL232 is available from Digi-Key, P.O. Box 677, Thief River Falls MN 56701-0677. Phone (800) 344-4539. See Figure 5 for this circuit.

Just the Beginning

This project is not an end unto itself; it is really the beginning. The CAT interface is a door to all the control ideas you have running around inside your head when you bought your radio. It's simple to build, and you can begin experimenting with software (don't let anybody tell you it can't be done in BASIC—they haven't proven that to me yet!). Spread spectrum, maybe?

Design Your Own CAT Program

After you do the simple hardware tests on the Universal CAT Interface, you'll be itching to try your system in the CAT mode. Presented here is a GW-BASIC (Version 3.2) program which I believe you can use to adapt to any CAT equipped radio. "Those are big words, stranger." I know, I know. The big problem is a lack of a CAT standard. If there are two radios with the exact same I/O command set I am unaware of them! I would urge the radio industry to get together and agree on a standard command set for CAT control. But you have to start somewhere and I would like to plant this program which I have put into the Public Domain into your schedule and let you run with it.

It's not going to be easy, but it is relatively simple. You'll understand what I mean if you'll commit to the attempt, and if you will just maintain an I-CAN-DO-IT attitude, take your time and keep trying, you will eventually get the desired results. And I can't describe what a great feeling it is to see the radio respond to your keyboard.

You lucky FT-980 owners can use the program as is. It will come up and capture the radio and display all 148 status bytes from the radio. It will settle on 20 meters, USB, 14.250.000, picked because that is the example in the YAESU manual. Hit <ENTER> and the radio switches to AM and WWV on 10 MHz. Hit <ENTER> again and the radio switches to 10 meter FM and begins a frequency scan from 29.500 to 29.690 ad infinitum. You can interrupt the scan or resume it by hitting any key at any time. The screen displays the frequency too. <F1> exits the program at any point you desire.

The one quirk 980 owners will discover is that it will require two tries to capture the radio the first time. Run the program and after a few seconds do a Ctrl-Break. Then run it again. From then on (unless you turn the radio off) it will run on the first try. Sure, you can add a fix. I had to add one to my Pascal version, but it is beyond the scope of this exercise.

OK, so what if you own a radio other than the FT-980? This program will be a good solid starting point. Oh yes, it will require some knowledge of BASIC, patience and study, but the trek will be worth it. The program has the two main ingredients necessary for CAT activity: a way to output commands and a way to capture data from the radio.

First study your manual and become familiar with the sequencing of events that your radio requires. The FT-980, for example, requires the following:

1. Send a command to the radio.
2. Receive an echo of the command from the radio.
3. Have your software compare the command against the echo. If they are the same, then perform the next step, #4. If not, then start over again at step #1.
4. Send OK-TO-EXECUTE command to the radio.
5. Receive a status stream from the radio to update the changes it just made.

WOW! Well the fact is the FT-980 is one of the more complicated CAT radios ever put on the market. (I give that a plus, not a minus!) Unlike the sequence listed above, your radio may only need to receive a command to change mode or frequency. It may or may not "talk" back to your computer at all. So at this point we can begin to trim down the CAT_SEED program to customize it to your radio. In the following steps when you're advised to "eliminate the following lines" you might wish to simply REMark them out—just in case.

Tailor the Program For Your Particular Radio

1. Eliminate line 2030; it surely just applies to the FT-980.

2. If your radio isn't captured during a CAT session, that is, if it only responds to commands but the front panel controls re-

DISCOVER LOW PRICES

PL-259 Nickel-Teflon, USA 69¢ ea. or $15/25
PL-259 Silver-Teflon, USA $1.29 ea. or $25/25
PL-259 Gold-Teflon, USA $1.49 ea. or $30/25
N Connector for 9913, 9086, CQ-Flex $3.15

9086 International (like 9913, but better) 46¢
CQ-Flex! New! Flexible 9913-type, low loss for crank-up tower, rotators, HF - UHF 62¢
CQ-RG-8X MM 95% Solid, Type IIA Cover 23¢
RG-8X 95% Braid, Premium Qual. 16¢
RG-213 Mil-Type Prem. Coax 34¢

300 Ohm Poly Ladder-Line 13¢
450 Ohm Poly Ladder-Line 13¢
300 Ohm Heavy Twin 13¢
72 Ohm Super Twin 29¢
#14 Antenna Wire 8¢

Wire & cable Sale prices on 100' incr. only.

RADIO WORKS

BALUNS
Current-type
Laboratory Developed
Unequaled Specifications
14 models for every application
Superior Construction, Stainless hardware

B1-2K 1:1 2KW Current-Balun $17.95
B4-1.5K 4:1 Low loss 1.5K 80-10M $19.95
Y1-4K Current-type Beam Balun 1:1 4KW $24.95
Remote Balun 4:1 Open-wire to coax Current-Balun $28.95

(804) 484-0140

Free 80 page Discount Catalog. Everything for wire antennas, connectors, coax. Allow 4 - 6 weeks for Bulk mail delivery of Catalog or send $2 for catalog by Priority Mail. Mention ad for these prices. Prices are subject to change. ADD SHIPPING - Call for COD. Visa & MC welcome. Give card #, exp. date, signature. VA residents add 4.5% Sales tax. See ad in *QST* and *CQ*.

DEALER INQUIRIES INVITED

Box 6159 • Portsmouth, VA 23703

CIRCLE 150 ON READER SERVICE CARD

- 60dB display dynamic range
- 40dB spurious rejection
- 60 uv sensit, ±2dB flatness
- 1 KVDC, 1v @ 100 MHz max input as isolated by 10pF
- ±7%hor frequency linearity

107 SPECTRUM PROBE™

converts your scope into a 100MHz spectrum analyzer

$249 dealers wanted

30 Day refund VISA/MC

Specifications & app. ideas

Smith Design 1324 Harris
Dresher, PA 19025 (215) 643-6340

SCARED OF THE CODE?

IT'S A SNAP WITH THE ELEGANTLY SIMPLE MORSE TUTOR ADVANCED EDITION FOR BEGINNERS TO EXPERTS—AND BEYOND

Morse Code teaching software from GGTE is the most popular in the world—and for good reason. You'll learn quickest with the most modern teaching methods—including Farnsworth or standard code, on-screen flashcards, random characters, words and billions of conversations guaranteed to contain every required character every time—in 12 easy lessons.

Sneak through bothersome plateaus in one tenth of a word per minute steps. Or, create your own drills and play them, print them and save them to disk. Import, analyze and convert text to code for additional drills.

Get the software the ARRL sells and uses to create their practice and test tapes. Morse Tutor Advanced Edition is approved for VE exams at all levels. Morse Tutor is great—Morse Tutor Advanced Edition is even better—and it's in user selectable color. Order yours today.

For all MS-DOS computers (including laptops). Available at dealers, thru *QST* or *73* or send $29.95 + $2 S&H (CA residents add 6% tax) to:
GGTE, P.O. Box 3405, Dept. MS, Newport Beach, CA 92659
Specify 5¼ or 3½ inch disk
(price includes 1 year of free upgrades)

73

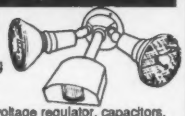
CIRCLE 193 ON READER SERVICE CARD

Courteous Service • Discount Prices • Fast Shipping

ALL ELECTRONICS

P.O. Box 567 • Van Nuys, CA 91408

INFRARED SECURITY LIGHT (AS-IS)

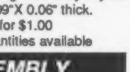


Experiment with infrared sensors with these outdoor security lights. Contain lots of interesting components, and IR detector, photoresistor, relay,transformer, IC's, voltage regulator, capacitors, trimpots and other goodies. Returned to the distributor for variety of reasons, we've found that most of them work to some extent. We don't want to test them and would prefer to sell them "as-is" at a greatly reduced price. Mounts to any standard electrical junction box. Infrared sensor detects movement up to 65 feet and turns on lights. Sensor can be adjusted for sensitivity and duration of lighting. The position of the sockets and the infrared sensor can be easily adjusted. Will handle two 150 watt PAR 38 lamps. Suitable for wet locations. Bulbs not included.CAT# IL-101 $7.50 each

HALL EFFECT LATCH

Sprague # UGN3075LT
Operates on 4.5 - 24 Volts
Can sink 10 ma. With suitable output pull up, can be used directly with bipolar or CMOS logic circuits. Especially suited for electronic commutation in brushless D.C. motors using multiple ring magnets. Very tiny surface mount package 0.175" X 0.09"X 0.06" thick.
CAT # HESW-5 2 for $1.00
100 for $45.00 Large quantities available

FLASH ASSEMBLY

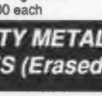


This NEW compact flash assembly comes from a U.S. manufacturer of cameras. Unit operates on 3 Vdc and measures 2 1/2" X 1 1/4". Ideal for use as a strobe, warning light or attention getter. Complete with instruction on how to wire.
CAT# FSH-1 $3.75 each 10 for $35.00

ULTRASONIC CERAMIC MICROPHONE/TRANSDUCER

Panasonic (Matsushita) # EFR RCBK40K54
An ultrasonic microphone consisting of a bimorph type piezoelectric ceramic vibrator. Ideal for burglar alarms, auto door openers, flow rate detectors and remote control systems. Nom. Freq. 40 kHz. Max input volts: 20 Volts. 15/16" diameter X 3/8" high. 5/8" long leads.
CAT# UST-1 $1.00 each

HIGHEST QUALITY METAL C-60 CASSETTES (Erased)



Premium quality metal tape in C-60 cassettes (30 min. per side). One of the finest "brand-name" tapes on the market, in durable, clear plastic transport mechanisms. Recorded and bulk erased, the record-protect tabs have been removed and therefore, need to be taped over to re-record. Audiophiles will appreciate the wide dynamic range of this tape. If your cassette deck has a "metal" setting you will hear the difference. A real bargain!
CAT# C-60M $1.25 each • 10 for $10.00

TOLL FREE ORDER LINES
1-800-826-5432
CHARGE ORDERS to Visa, MasterCard or Discover

TERMS: Minimum order $10.00.Shipping and handling for the 48 continental U.S.A. $3.50 per order. All others including AK, HI, PR or Canada must pay full shipping. All orders delivered in CALIFORNIA must include state sales tax (6 %, 6 1/4%, 6 1/2 %, 7 %) .Limited Quantities. NO C.O.D. Prices subject to change without notice.

Call or Write For Our FREE 60 Page Catalog
(Outside The U.S.A. Send $2.00 Postage)
ALL ELECTRONICS CORP.
P.O. Box 567 • Van Nuys, CA • 91408

CIRCLE 194 ON READER SERVICE CARD

```
10 '       P U B L I C   D O M A I N   CAT SEED P R O G R A M
15 '*****************************************************************
16 '* This program may be freely distributed and exchanged. It may  *
17 '* be rewritten, modified, changed and/or expanded. Indeed you   *
18 '* are  encouraged to do so to make it work with your particular *
19 '* radio. You need not even give this author any credit. While   *
20 '* this program is originally intended for the YAESU(tm) FT-980  *
21 '* transceiver, a careful approach and rewrite should make it a  *
22 '* seed for the development of most other ham radios on the      *
23 '* market. One request: share your ideas with others. This is an *
24 '* still an exciting frontier of ham radio. On with it!          *
25 '*      (Program prepared at the suggestion of 73 Magazine)      *
26 '*       Art Harding K5YEF, PO Box 1719, Plano, Tx 75074         *
27 '* Full featured FT-980 EXE program available from above address *
28 '*****************************************************************
50 GOSUB 9000 'Set up your computer COM port
60 GOSUB 1000   'INITIALIZATION
70 GOSUB 2000   'Begin CAT action
80 'Release radio and shut down COM port
90 CMD$=ONOFF$:GOSUB 6000
100 PRINT#1,OK$;
110 CLOSE #1
120 PRINT:PRINT:PRINT"Radio released - COM 1 NOW CLOSED -Program complete..."
130 END
1000 '* INITIALIZATION
1010 OPTION BASE 1
1020 DIM ECHO$(5) 'Echo is same length as a command, 5 bytes
1030 DIM STATUS%(148) 'The FT-980 complete status stream, 148 bytes
1040 CMD$="     "   'This could have been a DIM CMD$(5), but this works too..
1060 OK$=CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(&HB)       'OK to execute CMD
1070 ONOFF$=CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)              'ON-OFF CMD
1080 ALLSTATUS$=CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(&H1)  'Status ALL CMD
1085 TIMER1=4000 'Change if trouble with receiving status inputs
1090 TIMER2=1000 'Change for hang time between 10 meter FM freqs
1100 GEN$=CHR$(&H21): HAM$=CHR$(&H22):              'Choose GENeral or HAM vfo
1110 USB$=CHR$(&H11): AMW$=CHR$(&H14): FM$=CHR$(&H17)       'Some modes choices
1120 MR$=CHR$(&H1E): VFO$=CHR$(&H1F)                       'MEMory or VFO choice
1130 RETURN
2000 '* MAIN PROCESSING
2010 '1)Capture radio 2)Choose VFO 3)Choose HAM/VFO 4)Choose USB 5)Choose freq
2020 CMD$=ONOFF$: R=148: GOSUB 5010   'R is the number of status bytes expected
2030 IF STATUS%(27)=1 THEN PRINT "Radio Is Captured!" ELSE 2020
2040 CHOICE$=VFO$: R=22: GOSUB 5000
2050 CHOICE$=HAM$: R=22: GOSUB 5000
2060 CHOICE$=USB$: R=22: GOSUB 5000
2070 'The next line changes the frequency. You can "read" 142500 reading
2080 'from the next to last byte, right to left.
2090 CMD$=CHR$(0)+CHR$(&H50)+CHR$(&H42)+CHR$(1)+CHR$(&H8): R=5: GOSUB 5010
2100 CMD$=ALLSTATUS$:R=148:GOSUB 5010 'Task radio for a complete status
2110 GOSUB 9100
3000 PRINT:PRINT:PRINT "Hit any key to switch to WWV on 10 MHz (F1=quit)"
3010 GOSUB 9999 'Hang around for next key hit
3020 GOSUB 9200
3030 GOSUB 9100:
3040 PRINT"Compare the 2 status displays now on the screen. Notice the changes."
4000 PRINT: PRINT"Hit any key to scan 10 meter FM frequencies...(F1 to quit)"
4010 GOSUB 9999
4020 GOSUB 9500
4030 RETURN
5000 CMD$=CHR$(0)+CHR$(0)+CHR$(0)+CHOICE$+CHR$(&HA)
5010 ' OUTPUT COMMAND - GET ECHO - COMPARE/CONFIRM - GET STATUS
5020 GOSUB 6000          'Output Command, Get ECHO
5030 GOSUB 7000                  'OK
5040 GOSUB 8000                  'Get status
5050 RETURN
6000 '* OUTPUT COMMAND AND GET ECHO
6010 '*
6020 N=0
6030 COM(1) OFF
6040 PRINT#1,CMD$; 'ALL CAT radios will need to do this!
6050 N=N+1: IF (EOF(1) AND N<TIMER1) THEN 6050 'Wait for input but not forever!
6060 REM IF N>=TIMER1 THEN 7100 'Oh oh, no COM action was detected, try again.
6070 WHILE NOT EOF(1): ECHO$=INPUT$(5,#1): IF LOC(1)=0 THEN 6080:WEND
6080 IF ECHO$=CMD$ THEN RETURN: ELSE PRINT"Echo received does NOT match command!
     [trying again]": GOTO 6020
7000 '* send OK to 980
7010 COM(1) ON 'Prepare Event Trap for expected incoming status stream
7020 PRINT#1,OK$; 'The FT-980 OK CMD - ok to execute last command sent
7030 RETURN
8000 '*Get Status
8010 IF EOF(1) THEN 8010
8020 FOR S=1 TO 4000: IF R=1 THEN 8030: NEXT 'Twittle thumbs loop while trapping
8030 COM(1) OFF 'No more input expected at this time
8040 RETURN
9000 'Set up Com Ports, event trap and F1 key trap
9005 'If you get port errors then increase CS10 to CS100 if you have a fast
9006 'computer. For slow computers (10 MHz down) eliminate CS parameter -
9007 'i.e., just CS with no value. These changes are made on line 9010.
9010 OPEN "COM1:4800,N,8,2,RS,CS10,DS0,BIN" FOR RANDOM AS #1
9020 REM FOR S=1 TO 2000: NEXT 'Allow time for port to settle down????
9030 ON COM(1) GOSUB 10000
9040 COM(1) ON
9050 ON KEY (1) GOSUB 80 'F1 key will release radio, close port and quit
9060 KEY (1) ON
9070 RETURN
9100 'Print all status bytes on screen in Hex...
9110 PRINT:PRINT "STATUS Input in Hex (Compare with your manual):"
9120 FOR S=1 TO 148: PRINT " "HEX$(STATUS%(S));: NEXT S
9130 PRINT:PRINT:PRINT"Bytes 2 thru 5 above yield Frequency: ";
9140 FOR S=2 TO 5: PRINT HEX$(STATUS%(S));:NEXT S
9150 RETURN
9200 'SWITCH TO GENERAL VFO, AM AND WWV ON 10 MHz
9210 CHOICE$=GEN$: R=22: GOSUB 5000
```

Listing continues

Figure 6. A universal CAT interface program (CAT__SEED) for IBM compatibles (written in GW-BASIC). This program is available from the author (see the Parts List) or can be downloaded from the 73 BBS under the 73MAG SIG at (603) 525-4438.

Listing continued

```
9220 CHOICE$=AMW$: R=22: GOSUB 5000
9230 CMD$=CHR$(0)+CHR$(0)+CHR$(0)+CHR$(&H1)+CHR$(&H8): R=5: GOSUB 5010
9240 RETURN
9500 'SCAN FOR 10 METER FM ACTIVITY
9510 PRINT: PRINT: PRINT"Hit any key to stop and restart scan (F1 to quit)"
9520 CHOICE$=VFO$: R=22: GOSUB 5000
9530 CHOICE$=HAM$: R=22: GOSUB 5000
9540 CHOICE$=FM$: R=22: GOSUB 5000
9550 TEN$=CHR$(&H95): GOSUB 9580: PRINT
9560 TEN$=CHR$(&H96): GOSUB 9580: PRINT: PRINT"* Complete cycle (F1=quit)"
9570 GOTO 9550 'Keep the loop going forever - or until <F1> hit
9580 FOR Q9=1 TO 10
9590 T=1
9600 READ F
9610 BUMP$=CHR$(F)
9620 CMD$=CHR$(0)+BUMP$+TEN$+CHR$(&H2)+CHR$(&H8): R=5: GOSUB 5010
9630 FOR S9=2 TO 5: PRINT HEX$(STATUS%(S9));:NEXT S9
9640 PRINT" ";
9650 T=T+1: IF(INKEY$="" AND T<TIMER2) THEN 9650
9660 IF T<TIMER2 THEN T=1: GOSUB 9999
9670 NEXT
9680 RESTORE 9700
9690 RETURN
9700 DATA &H0,&H10,&H20,&H30,&H40,&H50,&H60,&H70,&H80,&H90
9999 IF INKEY$="" THEN 9999 ELSE RETURN
10000 'THERE IS A CHARACTER RECEIVED!
10010 WHILE NOT EOF(1):STATUS%(R)=ASC(INPUT$(1,#1)):R=R-1:WEND
10020 RETURN
```

main operational between commands, then you should eliminate the following lines: 90, 1070 and 2020.

3. If your radio does NOT echo the commands you send it, you should eliminate the following lines: 1020, 6050 thru 6080.

4. If your radio does NOT have an OK or EXECUTE-THE-COMMAND type command you should eliminate the following lines: 100, 1060, 5030, 7000 thru 7030.

5. Does your radio send back any information like a status stream or some sort of acknowledgement that the command took effect? If your radio does NOT send back anything, you should eliminate lines: 1030, 1080, 2110, 3030, 5040, 6030, 8000 thru 8040, 9100 thru 9150, and 10000 thru 10020. You may eliminate the variable R and all references to R.

Now the next thing you want to do is study the INITIALIZATION portion of the program, lines 1000 thru 1130. Whatever brand of radio you own it's going to need a command buffer defined in line 1040. The one in our seed program is presently 5 bytes. If you need less or more, change it accordingly. A 6 byte command would appear as CMD$=" " (that was six spaces) or perhaps even better, use DIM CMD$(6).

Other FT-980 commands are part of the initialization subroutine such as the command for VFO, USB, etc. Simply substitute commands required by your radio. If there is no substitution in some cases then eliminate that particular one and any other reference to it you may find in the program. After you get this program working then you can add the complete command set.

If your radio does receive status then be sure line 1030 is configured correctly. It is now 148 bytes, the maximum number of bytes the FT-980 radio will send to the computer at any one time. You should make it as large as the number of bytes your manual shows is the maximum you may receive from your radio.

What's left? One of the most important things: setting up the COM port for your particular needs. Let's look at line 9010: OPEN "COM1:4800,N,8,2,RS,CS10,DS, BIN" FOR RANDOM AS #1.

Check your GW-BASIC manual and your radio manual; make sure these parameters are correct. More than one program I've seen was "bad" because the author used one stop bit. Why not? The rest of the world uses one stop bit—but not the FT-980 PROM. It demands two! So make sure all is OK. The parameter 10 associated with CS above will most likely have to drop to zero if you are using a slow computer and a value higher than 10 for faster machines. I have tested the program at 4.77 MHz on a laptop (CS0) and at 16 MHz on a 386 machine (CS10). One other comment on the port: you may also use COM2 instead of COM1. If you wish to do this be sure to change all COM references throughout the program.

As you work with the program I recommend that you just concentrate on getting the computer/radio dialog going with consistent results. Then you can open up your imagination and add the bells and whistles. Today, my CAT980 program (available as shareware) has some pretty fancy displays, like filter plots, analog dials and user menus for instant deployment. Even a log is included which automatically records all the radio parameters of the moment. But there was a time when the program just sat there and did nothing.

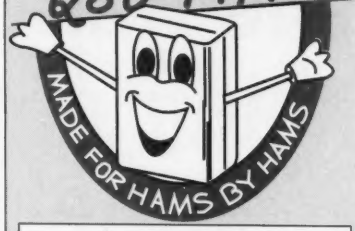
So with that in mind here is one last thought: share your basic ideas with other hams. Write an article or submit a listing to the technical correspondence sections of our magazines. Put your program on BBS's like CompuServe. And if you feel like you've got a program for the big leagues, then enter the world of Shareware. The real fun, and I believe this strongly, is still out there.

There's a barely scratched world of controlled excitement waiting to take shape, and like a lot of things in ham radio, we can have more fun if we keep each other informed. These pages and this interface are a good place to start. 73

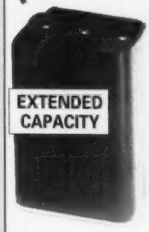
Contact Art Harding K5YEF at P.O. BOX 861719, Plano TX 75074. Please enclose an SASE.

REMEMBER...A LOW COST POWER PACK WITHOUT PERIPHEX'S QUALITY IS NO BARGAIN

PERIPHEX POWER PACKS FOR LONGER QSO TIME



NEW! SUPER PACKS FOR ICOM 2/4SAT & 24AT



BP-83 7.2V 600mah $33.50
BP-83S 7.2V 750mah $43.50
BP-84 7.2V 1000mah $57.00
BP-84S 7.2V 1400mah $63.00
BP-85S 12V 800mah $76.00

SAVE ON THESE POPULAR PERIPHEX POWER PACKS
BP-7S 13.2V 1200mah ... $65.00
BP-8S 9.6V 1200mah ... $65.00

SAVE WITH THESE YAESU VALUES

FNB-4SH 12V 1000mah $71.00
FNB-14S 7.2V 1400mah $59.75
FNB-17 7.2V 600mah $35.00
FNB-12 12V 500mah $45.95
FNB-2 10.8V 500mah $22.50

"SEND FOR FREE CATALOG"

KENWOOD PERFORMANCE PLUS

BIG SAVINGS!

PB-25/26S 8.4V 900mah $65.00
PB-1 12V 1200mah $67.00
PB-8S 12V 800mah $59.00

Manufactured in the U.S.A. with matched cells, these Super Packs feature short circuit protection and overcharge protection, and a 12 month warranty.
All inserts in stock or available from authorized dealers.
CALL US TO DISCUSS YOUR BATTERY REQUIREMENTS.

VISA DISCOVER MasterCard

Add $4.00 Shipping & Handling.
Connecticut residents add 8% tax.

PERIPHEX inc.
149 Palmer Road, Southbury CT 06488
800•634•8132
In Connecticut 203•264•3985 – FAX 203•262•6943

CIRCLE 68 ON READER SERVICE CARD

73 Review

by Dick Goodman WA3USG

The Kantronics KTU Telemetry Unit with Weathernode EPROM

Remote weather observations via packet!

Kantronics
1202 E. 23rd St.
Lawrence KS 66046
(913) 842-7745
Price Class: KTU—$300
Options: Anemometer—$110
Rain gauge—$ 90

Packet radio is the most rapidly growing and diverse mode in the history of amateur radio! In the early 1980s, the "Packet Revolution" was started by dedicated groups of amateurs in both Canada and the USA. These amateurs stimulated packet growth by setting standards and protocols, offering the first TNCs in kit form at a price affordable to amateurs and, perhaps most importantly, providing much needed information on this fledgling mode. As the years progressed, packet technology accelerated at an exponential rate.

Packet research and development, until recently, has been in the direction of increasing pure communications capabilities. There is another aspect of packet that is finally receiving attention, and that is data acquisition and control.

While communications, BBS usage, message handling and related applications will always be the mainstay of packet, automatic collection and forwarding of data will become widespread in the upcoming years. Wouldn't it be nice to have access to weather conditions at your club site via packet? Parameters such as temperature, wind speed, direction, and even rainfall could be valuable prior to starting an antenna work party. What about the condition of your club's repeater? Knowing the repeater's PA stage heat-sink temperature, PA current, line and Vcc voltages, and AGC voltage, could be most helpful to control operators. How about remote control of equipment? The capability to power down, energize, or reset various devices might be beneficial. Again, as with the "communications" aspect of packet, experimenters have been doing this for years, but until recently there has been no turnkey system to make this possible for the less technically orientated.

Data Acquisition and Control with the KTU

The Kantronics Telemetry Unit (KTU) with the Weathernode EPROM makes these functions possible. The KTU is a small device,

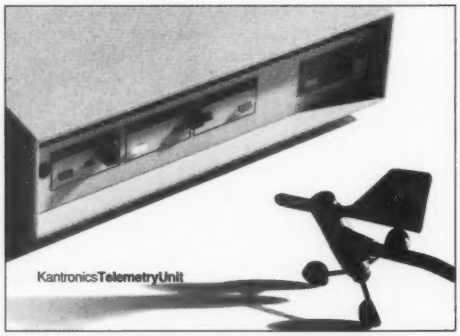


Photo. The Kantronics KTU Telemetry Unit.

1.75″ x 6″ x 8″, designated as Data Terminal Equipment (DTE). It simply plugs into your existing TNC where your computer (orterminal) would normally be connected. Your computer is then plugged into the rear of the KTU.

The power requirements are 11–20 VDC at 45 mA or, in the "Low Power" mode, 11–28 VDC at 30 mA. The KTU front panel is laid out quite simply. There is a power switch and a power indicator LED. Next to that, a "Telemetry/Local" switch and two LEDs show which position that switch is in. Finally there is a "Bypass" switch and companion indicator LED.

The KTU rear panel consists of a standard DB-25 connector for your computer or terminal, a modular style connector that connects to your TNC (cable and mating connector are supplied), and an 8-pin external sensor connector (cable and mating connector are supplied). Note that normal packet operation is not affected by the KTU; pressing the "Bypass" switch connects the terminal to the TNC and takes the KTU out of line.

Since the KTU includes the Weathernode EPROM, I got the optional anemometer/wind direction indicator. This unit, which includes mounting hardware, is of high quality plastic construction and requires minimal assembly. It's not necessary to calibrate the wind speed portion of the instrument; the wind direction sensor is calibrated with just a compass. Ensure that the instrument is mounted outside as high as possible, and away from obstructions, in order to obtain accurate readings. Both this unit and the external temperature sensor (included with the KTU) connect to the 8-pin connector on the rear of the KTU.

The serial cable from the computer should be connected to the DB-25 connector on the rear of the KTU, and the TNC connected to the KTU via the modular cable provided. These levels may be either RS-232 or TTL, set by internal jumpers in the KTU. If any cables have to be made up, pinouts for all connectors are adequately detailed in the documentation. Once these connections are made, the KTU may be powered up and initialized for operation with your TNC.

Set-Up and Configuration

Set your communications terminal for 8 data bits and the baud rate to match the TNC to the computer baud rate. Set the KTU "Bypass" and "Telemetry/Local" switches to "OUT," then apply power. The KTU will sign on your terminal with its autobaud routine and sign-on message. You will be prompted to enter the date and time.

Once this is completed, operational parameters may be set. These parameters are similar to those used in your TNC (e.g.: abaud, flow, echo, parity, xflow, etc.). The KTU will be optimized in this process to communicate with your TNC. Once the KTU is initialized, some TNC parameters will probably have to be modified. Those options are adequately explained in the documentation.

Once these steps are completed, the KTU is ready for programming. Programming the KTU instructs the unit on how often to sample the external sensors, how to display the results (metric/USA), how many entries to send in response to a data command, and how many entries may be stored in the KTU's inter-

COAXIAL RELAYS

COLLINS #410-0193-60 SPDT 1 KW RELAY with auxiliary contact and 28 VDC coil. "T" style with three N connections; 3x3.5x1.8, 1#.
Used **$24.95**

FXR #300-10031 SPDT 100 W RELAY, 28 VDC coil; DC to 1.5 GHz. Three BNC connections; 1.3x1.5x1.3.
Used **$9.95**

JENNINGS VACUUM RELAYS with 26 VDC coils; used: **#RB1J-26**, SPDT 12 KV pk 15 A; 3/4" threaded base... **$51.00**

RB3-26, DPDT 12 KV pk 30 A; 1.1" threaded base **$52.00**

RE-6B, SPDT 25 KV pk 25 A; 2.3" mount flange ... **$50.00**

POWER AMP TUBES used-checked: 4CX250R/8570W **$40.00**

SOCKETS for 4X150/4CX250; Johnson or Eimac Used: **#122-115** or =, 1100 pf w/chimney; 2.5" dia, ... **$18.00**

#SK-600 or =, 2700 pf; no chimney, 2.8" dia, ... **$17.50**

USLS-465-5 VACUUM VARIABLE CAPACITOR, 7-465 pf 5 KV max; shaft 1/2" Lx1/4" dia. O/a 5.5" Lx2.3" dia, 3#.
Used **$110**

Prices F.O.B. Lima, O.• VISA, MASTERCARD Accepted.
Allow for Shipping • Write for latest Catalog
Address Dept. 73 • Phone 419/227-6573

FAIR RADIO SALES
1016 E. EUREKA • Box 1105 • LIMA, OHIO • 45802

CIRCLE 75 ON READER SERVICE CARD

NEW!
DJ-560T Twinband
- CTCSS Encode/Decode Built-in
- RX: 130–173.995 MHz
  400–519.995 MHz
- TX: VHF–UHF Amateur Bands
- Feature Packed

Best twin band value!

Handies
DJ-120T•DJ-160T & 460T•DJ-200T
NEW DJ-560T Twin Band *NEW*

1-800-666-0908

DR-110T 2M Mobile
- 45 Watt - Mini Size
- CTCSS Encode/Decode Built-In
- Modifiable for Cap & Mars
- Great Value/Packet Favorite

Mobiles
DR-110T & 410T•DR-112T (NEW)
•DR-510T•DR-570T•DR-590T (NEW)

ALINCO

LOW DISCOUNT PRICES – FULL LINE OF ACCESSORIES

LENTINI COMMUNICATIONS

21 Garfield St., Newington, CT 06111
New equipment pricing and orders 1-800-666-0908 Out of State.
Tech questions, used gear, info 203-666-6227

We carry most major brands.
Hours: Mon–Fri. 10–6 Sat. 10–4

WE SHIP UPS
C.O.D.s WELCOME

CIRCLE 234 ON READER SERVICE CARD

SPY ON THE EARTH

See on your computer screen what 6 or more U.S., Russian and Japanese satellites see. Make money many ways. Makes a terrific science project. We manufacture and sell all the equipment you need. In business since 1956.

For complete details dial our electronic bulletin board anytime. 300-2400 baud. Modem configuration: 8 bits, 1 stop, no parity: (718)-740-3911. Voice 8AM-1PM: (718)-468-2720.

Or send $10 for fantastic 5 disk program set for your IBM-PC.

Vanguard Labs
196-23 Jamaica Ave., Hollis NY 11423

TWO METER SPECIAL

Motorola Micors: 45 watt, 8 Freq, 132–150 MHz, Drawer Unit Only, $70 each; with all accessories. 4 or 2 F Scan Accessory Group; $125 each.

GE Exec II: 138–155 MHz, 40 watt, Drawer Unit Only, $70 each; with 2 F Scan Accessories, $125 each.

GE Exec II: 42–50 MHz, 50 watt, Drawer Unit Only, $65 each, with accessory group; $125 each.

GE Century II: 1, 2, or 6 Freq, 25 watt, 138–155/148–174; $90 each.

Standard HX-300 portables: 138–144 MHz; $99 each.

CALL OR WRITE FOR CURRENT FLYER.
ALL SALES "CASH" OR "CERTIFIED FUNDS" SHIPPED BY UPS.

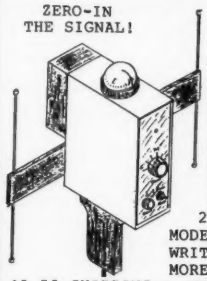
C.W. WOLFE COMMUNICATIONS, INC.
113 Central Avenue
Billings, Montana 59102

★FAX★FAX★FAX★
(406) 252-9617
★TELEPHONE★TELEPHONE★
(406) 252-9220

CIRCLE 20 ON READER SERVICE CARD

VECTOR FINDER

ZERO-IN THE SIGNAL!



HAND-HELD PHASE SENSE ANTENNAS FOR VHF DIRECTION FINDING. USES ANY FM XCVR. COMPASS GIVES DIRECTION. ARMS FOLD FOR STORAGE. TYPE VF-142 COVERS BOTH 2-MTRS & 220MHZ. OTHER MODELS AVAILABLE. WRITE OR CALL FOR MORE INFO.

$3.50 SHIPPING & CA. ADD TAX)

TYPE VF-142 $129.95

619-565-1319

RADIO ENGINEERS
3941 MT. BRUNDAGE AVE.
SAN DIEGO CA.92111

CIRCLE 58 ON READER SERVICE CARD

ATV CONVERTERS • HF LINEAR AMPLIFIERS

DISCOVER THE WORLD OF FAST SCAN TELEVISION

HF AMPLIFIERS per MOTOROLA BULLETINS

Complete Parts List for HF Amplifiers Described in the MOTOROLA Bulletins.

AN758 300W $160.70
AN762 140W $ 93.25
AN779L 20W $ 83.70
AN779H 20W $ 93.10
AR313 300W $403.00
EB63 140W $ 88.85
EB27A 300W $139.20
EB104 600W $448.15
AR305 300W $383.52

NEW!! 1K WATT 2–50 MHz Amplifier

UNIVERSAL DIGITAL FREQUENCY READOUT
VK–1 (Wired/tested) $149.95

HEAT SINK MATERIAL
Model 99 Heat Sink(6.5x12x1.6) ..... $ 22.00
CHS–6 Copper Spreader(6x6x1/4) ..... $ 18.00

We also stock Hard–to–Find parts

AMATEUR TELEVISION CONVERTERS
ATV2 420–450 ..... $ 44.95 Kit
ATV3 420–450 (GaAS–FET) ..... $ 49.95 Kit
ATV4 902–928 (GaAS–FET) ..... $ 59.95 Kit

AUDIO SQUELCH CONTROL for ATV
SIL ..... $ 39.95 Kit

2 METER VHF AMPLIFIERS
35 Watt Model 335A ..... $ 79.95 Kit
75 Watt Model 875A ..... $119.95 Kit
Available in kit or wired/tested

POWER SPLITTERS and COMBINERS
2–30MHz
600 Watt PEP 2–Port ..... $ 69.95
1000 Watt PEP 2–Port ..... $ 79.95
1200 Watt PEP 4–Port ..... $ 89.95

100 WATT 420–450 MHz PUSH–PULL LINEAR AMPLIFIER – SSB–FM–ATV
KE9G7—PK (Kit) $159.95
KE9G7—PCB (PC Board) ..... $ 18.00
KE9G7—I (Manual) ..... $ 5.00

CHIP CAPS–Kemet/ATC
METALCLAD MICA CAPS–Unelco/Semco
RF POWER TRANSISTORS
MINI–CIRCUIT MIXERS
SBL–1 (1–500Mz) ..... $ 6.50
SBL–1X (10–1000Mz) ..... $ 7.95
ARCO TRIMMER CAPACITORS
VK200–20/4B RF Choke ..... $ 1.20
5B–500–5B–3B Ferrite Bead ..... $ .20
Broadband HF Transformers

Add $ 3.50 for shipping and handling.

For detailed information and prices, call or write for our free catalog.

We ship worldwide.

CCI Communication Concepts Inc.
508 Millstone Drive • Xenia, Ohio 45385 • (513) 426–8600
FAX 513–429–3811

WE SHIP WORLDWIDE

CIRCLE 99 ON READER SERVICE CARD

Since 1975

THE ORIGINAL

2 Meter all Fiberglass Quad Now Available for 220 - 440 Mhz. All tested for less than 1.3:1 SWR over the entire legal operating range including **MARS** and **CAP**. Front to back ratio in excess of 24 db. Forward gain exceeds 10 db. Stacking hardware and harnesses available. Also 8 and 10 element 2 meter models for the absolute ultimate performance in DXing and packet radio. Also works wonders for satellite reception. 6 Element Quad ONLY $79.95 + 10.00 S&H. Order NOW

Performance Electronics
P.O. Box 310 • Conestee SC 29636
Call 24 Hours A Day (803) 299-1072

CIRCLE 288 ON READER SERVICE CARD

COMTELCO INDUSTRIES

Take Your H.T. Mobile!

MAGNET MOUNT
Dual Band Mobile
140 mhz, 440 mhz
or
Multi-Whip Mobile
140 mhz, 220 mhz, 440 mhz

19.95

150 Watt Power Rating
Supplied with 12ft of RG58 Coax
Choice of BNC or PL259 Connector

1-800-634-4622
Quality products Made in the U.S.A.

COMTELCO INDUSTRIES INC.
501 Mitchell Rd., Glendale Hts., IL 60139

CIRCLE 15 ON READER SERVICE CARD

CW CALLSIGN MONITOR

Sounds Alarm when it Hears Your Call

- Enjoy silent CW monitoring
- Automatically tracks code speed
- Built-in audio detector
- Does not require perfect code

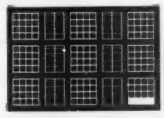
$39 complete $29 kit $17 PCB only
(includes complete technical data)

RF/AF PROTOTYPE/BREADBOARDS

(DC thru VHF)

- 4" x 6"
- Lots of Ground Trace
- Components may be mounted on foil or dielectric side
- Roll-tinned for good solderability

$7.95 each or send SASE for info and layout planning guide.



GARDEI ELECTRONICS
P.O. BOX 1751
WEST CHESTER, PA 19380

CIRCLE 80 ON READER SERVICE CARD

nal memory. Sensors may be sampled and displayed in a range of time from seconds to months. This versatility is quite impressive! The documentation goes into considerable detail on proper syntax and procedures. The KTU may be configured to operate with a variety of TNCs and is compatible with virtually all packet LAN configurations. The KTU may be programmed in a local mode directly from the terminal connected to it, or from over the air. Over-the-air programming requires entry of a password and other unique security constraints.

Using the KTU to obtain weather data is quite simple after reading the user instructions. These instructions are formatted to allow the KTU owner to simply photocopy both sides of one page in the KTU system manual and pass it along to potential users.

On-Line with the KTU

The TNC used for this review was the Kantronics KPC-4. By issuing a connect request to my station a user receives the normal "Connected to" response followed by a "wxn:" prompt. At this point the KTU may be queried for weather data, or programmed by the "Sysop." By simply typing a "D" for (D)ata, the KTU will display the last reading of wind speed, direction, external temperature, and internal KTU PC board temperature (see Figure 1). If the optional rain gauge sensor is installed, this data will also be presented. By entering the correct command, USA or Metric units may be specified. The data command may be modified to request virtually any number of entries from those stored internally.

An example of the data command syntax is: "Data TF 3 WS 5 WD 2"—This would display three readings of external temperature, five readings of wind speed, and two readings of wind direction. Entering the command "PR," displays how the data is being stored. An example of a reply to a "PR" request might be:

"PROGRAM R10M TP TF A15S WD WS
7813 Samples 1 Day 08:00:00."

This response to the "PR" command would tell the user that the internal and external temperatures are being sampled and recorded once every 10 minutes and the wind speed and direction are being averaged and recorded once every 15 seconds. The second line displays the capacity of the KTU's internal memory buffers in this data configuration. In this case, the buffers will store one day and eight hours of data before the earliest information is overwritten. Knowing this, the user can request data in a format useful to their application. If the outdoor temperature is being saved every 10 minutes, the user may not want every reading. Entering a data command of "Data TF 20 3" would display every third reading of temperature for 20 readings (or 20 readings in half-hour steps). All data read with the "Data" command is date and time stamped by the KTU (see Figure 2).

As you can see, by judicious use of programming, the Sysop can save data over long periods of time by keeping the sampling rate low. This would be efficient for day-to-day weather data collection. However, during unique weather phenomenon, the sampling rate may be increased on all sensors to allow instantaneous response to changing temperatures, wind speed, direction, and rainfall. This would be excellent for recording the passage of storm fronts and the like. With this simple, yet versatile data gathering language, the user may request data from any sensor as little or as often as desired.

Other Capabilities

The KTU will support up to seven sensors attached to the rear panel inputs. Each of these sensors accepts a 0–5 VDC input. These inputs are those that are presently being accessed by the Weathernode EPROM. Depending on how the KTU is configured (with internal jumpers), certain rear panel connections may also be programmed to output digital levels (0 and 5 VDC). These connections may also be commanded to generate pulses with the frequency being determined by the user via the "F0" or "F1" command. This capability would be excellent for controlling remote devices. All this is explained in the KTU system manual. This sophisticated data acquisition mode may not be used in conjunction with the Weathernode, since the weather sensors use all rear panel inputs.

Observations

The KTU did absolutely everything that it was advertised to do. I was impressed with the ease of assembly of the weather instruments and their quality. The anemometer tracks what my existing Heathkit unit displays to within about five percent. The wind direction indicator provides resolution down to single degree units and displays this data in both heading and compass rose notation (e.g.: N, NE, ENE, etc.). The external temperature sensor comes with about 50 feet of connecting cable, as does the anemometer. It is also possible to add additional cable without affecting the calibration of the unit.

```
wxn: d

06/16/91   18:19:54 TPCB= +0079.1 DEGF
06/16/91   18:19:54 TF  = +0083.3 DEGF
06/16/91   21:32:28 WS  = 00012 MPH
06/16/91   21:32:28 WD  = 00268 DEG  W
```

Figure 1. Response to the data retrieve command, "D". Current readings for all attached sensors are displayed. TPCB = PC board temperature, TF = external temperature (deg. F.), WS = wind speed, and WD = wind direction.

```
wxn: d tf 20

06/16/91   18:19:54 TF  = +0083.3 DEGF
06/16/91   18:14:54 TF  = +0083.3 DEGF
06/16/91   18:09:54 TF  = +0083.3 DEGF
06/16/91   18:04:54 TF  = +0083.8 DEGF
06/16/91   17:59:54 TF  = +0084.8 DEGF
06/16/91   17:54:54 TF  = +0084.8 DEGF
06/16/91   17:49:54 TF  = +0084.8 DEGF
06/16/91   17:44:54 TF  = +0084.8 DEGF
06/16/91   17:39:54 TF  = +0084.8 DEGF
06/16/91   17:34:54 TF  = +0085.0 DEGF
06/16/91   17:29:54 TF  = +0085.0 DEGF
06/16/91   17:24:54 TF  = +0085.0 DEGF
06/16/91   17:19:54 TF  = +0085.3 DEGF
06/16/91   17:14:54 TF  = +0085.3 DEGF
06/16/91   17:09:54 TF  = +0085.3 DEGF
06/16/91   17:04:54 TF  = +0085.3 DEGF
06/16/91   16:59:54 TF  = +0085.8 DEGF
06/16/91   16:54:54 TF  = +0085.8 DEGF
06/16/91   16:49:54 TF  = +0085.8 DEGF
06/16/91   16:44:54 TF  = +0085.8 DEGF
```

Figure 2. Issuing a "TF20" command displays the last twenty external temperature readings.

The KTU itself is small and has minimal power requirements. I thought that since the internal temperature sensor was located inside the KTU it would indicate considerably higher temperatures than ambient due to component heating. This is not the case, due to the low current requirement of the KTU. The internal temperature displayed by the KTU is within a degree or two of the actual air temperature.

Finally, it took me no more then one hour to get everything fully operational (and that's from the time I opened the two boxes that the units were shipped in). The Kantronics firmware in the KTU operated flawlessly. The flexibility in the way weather data may be captured and presented should meet the requirements of the most demanding amateur and professional meteorologists. The only room for improvement I could suggest is that memory slots be made available for high and low temperatures and peak wind speeds. This data may be derived from the stored weather data, however.

With the development of additional EPROMS, telemetry and data acquisition from a wide variety of applications will be possible. Kantronics has effectively entered a new era in packet technology with this innovative product! 73

EVERY ISSUE of *73* on microfiche!

The entire run of *73* from October, 1960 through last year is available.

You can have access to the treasures of *73* without several hundred pounds of bulky back issues. Our 24x fiche have 98 pages each and will fit in a card file on your desk.

We offer a battery operated hand held viewer for $75, and a desk model for $220. Libraries have these readers.

The collection of over 600 microfiche, is available as an entire set, (no partial sets) for $250 plus $5 for shipping (USA). Annual updates available for $10.

Your full satisfaction is guaranteed or your money back. Visa/MC accepted.

BUCKMASTER PUBLISHING
"Whitehall"
Route 3, Box 56
Mineral, Virginia 23117

703-894-5777
800-282-5628

CIRCLE 168 ON READER SERVICE CARD

Number 12 on your Feedback card

DEALER DIRECTORY

DELAWARE

New Castle

Factory authorized dealer! Yaesu, ICOM, Kenwood, Ten-Tec, AEA, Kantronics, DR-SI Mfg., Ameritron, Cushcraft, HyGain, Heath Amateur Radio, Heil Sound. **DELAWARE AMATEUR SUPPLY, 71 Meadow Road, New Castle DE 19720. (302) 328-7728.**

IDAHO

Preston

Ross WB7BYZ has the largest stock of amateur gear in the intermountain West and the best prices. Over 9,000 ham related gear in stock. Call us for "all" your ham needs today. **ROSS DISTRIBUTING CO., 78 S. State, Preston ID 83263. (208) 852-0830.**

NEW JERSEY

Park Ridge

North Jersey's oldest and finest Shortwave and Ham Radio Dealer. 1½ miles from Garden State Parkway. Authorized Dealers for AEA, Kenwood, Japan Radio Company, ICOM, Yaesu, etc. Ham Sales, Lee WK2T. **GILFER SHORTWAVE, 52 Park Ave., Park Ridge NJ 07656. (201) 391-7887.**

NEW YORK

Manhattan

Manhattan's largest and only ham and business Radio Store. Featuring MOTOROLA, ICOM, KENWOOD, YAESU, AEA, SONY, PANASONIC, MFJ, GBC CLOSED CIRCUIT TV CAMERAS AND MONITORS, BIRD WATTMETERS, OPTO ELECTRONICS FREQUENCY COUNTERS, AOR SCANNERS, TEN-TEC, ETC. Full stock of radios and accessories. Repair lab on premises. Open 7 days. M-F, 9-6 p.m.; Sat. & Sun., 10-5 p.m. We ship *Worldwide*. For Specific information call or write: **BARRY ELECTRONICS, 512 Broadway, New York NY 10012. (212) 925-7000. FAX (212) 925-7001.**

OHIO

Columbus

Central Ohio's full-line authorized dealer for Kenwood, ICOM, Yaesu, Alinco, Info-Tech, Japan Radio, AEA, Cushcraft, Hustler, and Butternut. New and used equipment on display and operational in our 4000 sq. ft. store. Large SWL department, too. **UNIVERSAL RADIO, 1280 Aida Drive, Reynoldsburg (Columbus) OH 43068. (614) 866-4267.**

PENNSYLVANIA

Trevose

Authorized factory sales and service. KENWOOD, ICOM, YAESU, featuring AMERITRON, B&W, MFJ, HYGAIN, KLM, CUSHCRAFT, HUSTLER, KANTRONICS, AEA, VIBROPLEX, HEIL, CALLBOOK, ARRL Publications, and much more. **HAMTRONICS, INC., 4033 Brownsville Road, Trevose PA 19047. (215) 357-1400. FAX (215) 355-8958. Sales Order 1-800-426-2820.** Circle Reader Service 298 for more information.

DEALERS: Your company name and message can contain up to 50 words for as little as $420 yearly (prepaid), or $210 for six months (prepaid). No mention of mail-order business please. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the April '91 issue must be in our hands by February 1st. Mail to *73 Amateur Radio Today*, Box 278, Forest Road, Hancock NH 03449.

AMATEUR TELEVISION

SMILE! YOU'RE ON TV

Only $329

Designed and built in the USA Value + Quality from over 25years in ATV...W6ORG

With our all in one box TC70-1 70cm ATV Transceiver you can easily transmit and receive live action color and sound video just like broadcast TV. Use any home TV camera or VCR by plugging the composite video and audio into the front VHS 10 pin or rear phono jacks. Add 70cm antenna, coax, 13.8 Vdc and TV set and you are on the air...it's that easy!

TC70-1 has >1 watt p.e.p. with one xtal on 439.25, 434.0 or 426.25 MHz, runs on 12-14 Vdc @ .5A, and hot GaAsfet downconverter tunes whole 420-450 MHz band down to ch3. Shielded cabinet only 7x7x2.5". Transmitters sold only to licensed amateurs, for legal purposes, verified in the latest Callbook or with copy of license sent with order.

Call or write now for our complete ATV catalog including downconverters, transceivers, linear amps, and antennas for the 70, 33, & 23cm bands.

(818) 447-4565 m-f 8am-5:30pm pst. Visa, MC, COD

P.C. ELECTRONICS
2522 Paxson Ln Arcadia CA 91006

Tom (W6ORG)
Maryann (WB6YSS)

NEWS BULLETIN

CALL US NOW!

YOUR HAM DOLLAR GOES FURTHER AT . . .

CALL OR WRITE FOR SPECIAL QUOTE

When it comes to FAST DELIVERY, HONEST DEALING and PROMPT, DEPENDABLE S-E-R-V-I-C-E back-up We don't just advertise it — WE GIVE IT!

we'll treat you

SELECTION
S-E-R-V-I-C-E
and
SATISFACTION!

Burghardt INC.
AMATEUR CENTER
"AMERICA'S MOST RELIABLE AMATEUR RADIO DEALER"

SELL-TRADE
New & Reconditioned
HAM EQUIPMENT

Call or Write Us Today For a Quote!
You'll Find Us to be Courteous, Knowledgeable and Honest

PHONE (605) 886-7314
FAX (605) 886-3444

In 1937, Stan Burghardt (WØIT), because of his intense interest in amateur radio, began selling and servicing amateur radio equipment in conjunction with his radio parts business. We stand proud of this long-lasting tradition of ***Honest Dealing, Quality Products and Dependable "S-E-R-V-I-C-E"!***

Above all, we fully intend to carry on this proud tradition with even more new product lines plus the same ***"fair"*** treatment you've come to rely on. Our reconditioned equipment is of the finest quality with ***30, 60*** and even ***90-day*** parts and labor warranties on selected pieces. ***And always remember:***

— WE SERVICE WHAT WE SELL —

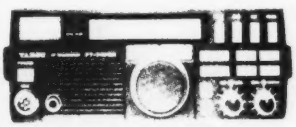
AEA	B & W	Daiwa	Palomar
Alinco	Belden	Hustler	Radio Callbook
Ameritron	Bencher	Kantronics	Ritron
Amphenol	Bird	Kenwood	Rohn
Ampire	Butternut	Larsen	Telex/Hygain
Antenna Specialists	Centurion	MFJ	Ten-Tec
Astron	CES	Mirage/KLM	Unadilla/Reyco
	Cushcraft	Mosley	Yaesu

STORE HOURS:
9-5 P.M. (CST)
MONDAY thru FRIDAY
OPEN SATURDAYS
from 9-1 P.M. (CST)
CLOSED
SUNDAYS/HOLIDAYS

MasterCard VISA

182 N. Maple
P.O. Box 73
Watertown, SD 57201

Write today for our latest Bulletin/Used Equipment List.



Get the most of HF Mobiling

Yaesu FT-747GX

SPECIAL OFFER!

CALL TODAY FOR SPECIAL QUOTE

Hope for Monolingual Hams

If you really want to communicate!

by David Cowhig WA1LBP

Most hams on or orbiting this planet do not speak English as their first language. *The Radio Amateur's Conversation Guide,* written by Jukka OH1BR and Miika OH2BAD Heikinheimo, with the help of ham native speakers, teaches monolingual hams how to get their tongues into acceptable shape for foreign ears. The second edition, published in 1985, includes English, German, French, Italian, Spanish, Portuguese, Russian (in Cyrillic and phonetic script), and Japanese (romanized). Hour-long cassette tapes made by ham native speakers cover these languages, plus Swedish and Finnish.

Supplements to the *Guide* introduce you to Finnish, Danish, Dutch and Serbo-Croatian. Phonetic guides and number lists are followed by 50 pages of phrases in each of the eight languages of the *Guide.* In the 30-page multilingual glossary at the back of the book, you can look up the equivalent of English words commonly used by hams in seven other languages.

The phrases give you all you need to conduct a very basic QSO (contact), describe your equipment, complain about the other guy's splatter, inquire into the other operator's marital status (an important question for international radio romances), and ask for a QSL card. Next time a Japanese station QRMs (interferes with) your long rag-chew on 160 meters, you can tell her "Shuhatsu-o tsukatteimasu!" If the offending OM (male ham) is in Moscow, you might say, "Castata zanjata!" If you want to ask a Russian to give you a call next time he hears you, why, just say, "Kagdá byi vyi ni uslýisali minjá pazálsta, vizavítje minjá" (and don't forget the accent marks).

Some You Have to Hear

Language tapes are necessary for those languages which English-speaking people find hard to pronounce. Japanese pronunciation is fairly easy and regular. You could probably make yourself understood in Japanese without the tape if the authors would explain the phonetic systems they use. Romanization is used for Japanese and Russian, but the conventional spelling of languages written in the roman alphabet is given. Just a list of the kana syllabary used to write Japanese would help readers pick out the pronunciation much more easily. The standard romanization of Japanese used in the *Guide* can mislead. For example "five years," *gonenkan,* is pronounced "go-nen-kan," not "gon-en-kan."

A one-hour tape of any language in the *Guide* costs $9.95 plus shipping. Text supplements cost $1.75 per language. You can order *The Radio Amateur's Conversation Guide,* by Jukka and Miika Heikinheimo, from *CQ Communications,* Main St., Greenville, NH 03048. Tel. (800) 457-7373. The price is $9.95 plus $3.75 postage.

Spanish and Russian

"Hola CQ," by "Doc" Schwartzbard AF2Y, gives you all the sentence patterns and vocabulary you need to carry out a basic QSO in Spanish. Many hams who took high school Spanish will find that the sentence patterns come back. Their new ham vocabulary also makes them want to learn more Spanish by radio.

The ARRL's "Hola CQ" consists of fine Spanish lessons for hams. A 90-minute cassette tape accompanying the text teaches the basics of Spanish pronunciation as well as the pronounciation of each phrase in the text. AF2Y reminds us of the many words Spanish shares with English and other romance languages, and how recognizing these words will speed our progress. You can get "Hola CQ" from the ARRL, 225 Main St., Newington CT 06111. It costs $7 plus postage.

Once you have mastered some phrases in your chosen language, you might try to find a night course at a local high school or junior college. You could also pick up a first-year college textbook on the language to get a systematic introduction to vocabulary and grammar. With your access to on-the-air tutoring, you may become an outstanding ham linguist.

Russian and Japanese in Particular

Other language lessons for hams are available. Len Traubman, with the help of some Russian hams, wrote "Russian Phrases for Amateur Radio," a 20-page booklet. The accompanying audio cassette tape is for English-speaking hams who want to communicate in Russian. The booklet contains English words and phrases for ham contacts, with Russian translation and transliteration for each phrase. You can get the booklet for $5 ($7 overseas) and the audio cassette for $6 ($8 overseas) from Len Traubman W6HJK, 1448 Cedarwood Drive, San Mateo CA 94403.

You can also download "Japanese for Hams," a 12-page guide I have written on making simple QSOs in Japanese, free from the *73* landline BBS (603) 525-4438; or from JAHAM in the files section of the N4QQ packet BBS. Call K3AF-7 in Washington, DC on 28.195 MHz 1200 baud, connect to K3AF-3, and then to N4QQ.

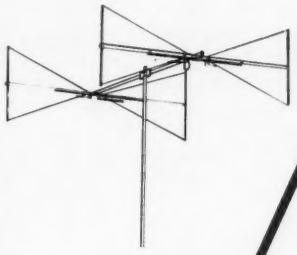
Goh Kawai 7L1FQE/N6UOK, a linguistics scholar at Stanford University, is working on a text of Japanese lessons for hams. You can contact him at CompuServe 76056,1726. If you get more serious about learning Japanese, you can order *Japanese for Beginners* and *Japanese for Today,* edited by Yasuo Yasuda, and published by Gakken, from Kinokuniya, 10 West 49th St., New York NY or from some other bookstore. Tapes accompany the text.

After you have worked on Japanese for awhile, you will find reading articles in *CQ Ham Radio,* the wonderful telephone-book-size (!!!) ham magazine from Japan, a great incentive to improve your Japanese. You can order *CQ Ham Radio* through Nihon IPS, Iidabashi 3-11-6, Chiyoda-ku, Tokyo 102 JAPAN for about $120 per year. You may be able to order single copies of it, or of its more technical cousin *Ham Journal.*

As the karatkavalnaviks (hams) say back in the U.S.S.R., "Zeláju vam udáci i mnóga di-eks": I wish you good luck and lots of DX. 73

David Cowhig has translated articles in Japanese for us and written articles on ham radio in Japan.

The HF5B "Butterfly"™
A Compact 2 Element Beam
for 20-15-12-10 Meters
Operate As A Dipole on 17 Meters



- Unique design reduces size but not performance.
- No lossy traps; full element radiates on all bands.
- Turns with TV rotor
- 19 lbs.

HF ANTENNAS FROM BUTTERNUT

Butternut Verticals

Butternut's HF verticals use highest-Q tuning circuits (not lossy traps!) to outperform all multiband designs of comparable size!

Model HF6V

- 80, 40, 30, 20 15 and 10 meters automatic bandswitching.
- Add-on kit for 17 and 12 meters available now.
- 26 ft. tall

Model HF2V

- Designed for the low-band DXer
- Automatic bandswitching on 80 and 40 meters
- Add-on units for 160 and 30 or 20 meters
- 32 feet tall - may be top loaded for additional bandwidth.

For more information see your dealer or write for a free brochure

BUTTERNUT ELECTRONICS CO.
405 East Market, Lockhart, TX 78644

PacComm • *Advanced Technology* • *Enduring Value*

NEW! The PacComm PSK–1T

- MicroSat Packet Communication is now easier than ever using the PacComm PSK–1 with built in TINY-2 TNC!
- Only two cables to connect — computer and radio
  - Revised radio interface simplifies cable assembly
  - Premade radio cable optionally available
- Modes of Operation:
  - 1200 bps Manchester AFSK/PSK for satellite access
  - 400 bps telemetry from Oscar 10 and 13
  - 1200 bps PSK for terrestrial use (10 meter DX, etc.)
  - 1200 bps AFSK for conventional packet
- Features:
  - Automatic Gain Control and Doppler Shift Correction
  - All modes selected by push buttons or computer commands
  - Open Squelch DCD feature on conventional AFSK
  - PacComm's popular personal Message System included
- Easily connects to PacComm EM–NB96 9600bps modem for Uo–14
- Existing PSK–1 modems can be factory upgraded to PSK–1T
- 30 day return privelege, one year factory warranty
- Ask your Dealer or contact PacComm for our latest catalog featuring the PSK–1, PSK–1T, and many new 9600 bps (and up) products.

PacComm Packet Radio Systems, Inc.

3652 W. Cypress St. Tampa, FL 33607–4916
(813) 874–2980 Orders: (800) 223–3511 Fax: (813) 872-8696

CIRCLE 152 ON READER SERVICE CARD

COMET
ANTENNAS FOR THE PROFESSIONAL AMATEUR

TRI-BAND

CX-630TN
Mobile Fiberglass Antenna
GAIN: 146MHz 2.35dB 446MHz 2.15dB
1200MHz 5.5dB
POWER: 20 watts
LENGTH: 3'5"
CONNECTOR: N-type

CFX-431
Triplexer w/Coax
POWER: 146MHz 800 watts
446MHz 500 watts
1200MHz 200 watts
CONNECTOR OUTPUT: N-type
146MHz INPUT: UHF
446MHz INPUT: N-type
1200MHz INPUT: N-type

CFX-4310
Triplexer w/o Coax
POWER: Same as CFX-431
CONNECTOR OUTPUT: N-type
146MHz INPUT: UHF
446MHz INPUT: UHF
1200MHz INPUT: N-type

Call For Your Nearest Dealer Or Catalog
1 (800) 962-2611

N.C.G. CO.
NCG Companies
1275 North Grove Street
Anaheim, CA 92806
(714) 630-4541/FAX (714) 630-7024

CIRCLE 54 ON READER SERVICE CARD

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Photo A. The pulse charger—upgraded to handle larger batteries.

The Pulse Charger

The use of batteries in portable QRP operation captivates the attention of a lot of people. In the August 1989 column, I discussed a small pulse charger for Gell/Cell™ batteries. This project produced huge piles of mail. The original circuit has been changed slightly, to improve switching, and a PC board is now available to speed construction.

Perhaps a quick review of the circuit is in order. The Gell/Cell battery is charged using high current pulses, rather than a constant current. High current pulses won't heat up the battery, which reduces the chance of damage.

Operation is simple. A 555 timer operating as an astable oscillator provides adjustable pulses to an IC voltage regulator. The duty cycle of the oscillator may be varied by the front panel 50k pot. This control adjusts the current to the battery by varying the pulse width from the 555 oscillator. The output of the 555 is coupled to the base of the 2N2222 transistor via a 1N914 diode. This diode protects the 555 just in case the LM317 goes out to lunch and takes the 2N2222 with it for company.

When the output of the 555 timer goes high, the transistor is turned on. This shorts out the ADJ line of the LM317, shutting it off. Thus, no current will go to the battery. When the 555 timer is off, so is the transistor, allowing the LM317 to operate at the voltage selected by one of the 5k trimmers. In a nutshell, when the 555 is on, the LM317 is off.

The 5k trimmers set the state-of-charge for the battery. For cycle use, a Gell/Cell battery should have a full state-of-charge voltage of 14.4 volts. For standby use, select 14.0 as a full state-of-charge voltage. I also have a handful of 6 volt gelled batteries I use now and then. So, the second voltage I selected is 7.2 volts.

NiCds

A note about NiCds before we get too far into this project. When this charger first came out, many of you asked about charging up HT batteries. Well, you can—*if* you understand some of the limits of both the charger and the NiCds. First and foremost, HT batteries are all different. Batteries that came with the HT and those you have replaced from a third-party vendor may be different. In most cases they *are* different.

I know of one particular battery pack that does some magic when dropped into the manufacturer's quick charger. The battery pack is normally 12 volts, but a small relay inside the battery pack switches the batteries to a 6 volt configuration to allow high speed charging. To keep things from blowing up, a heat sensor glued to one of the cell's case will open up, stopping the charge current until the cell has cooled down. Some third-party battery re-fitters don't include this sensor. How many of us, in repairing an HT battery pack, have removed the sensor?

If you use the pulse charger to charge up the NiCds for your HT, limit the current to whatever value is listed on the battery's charge table. After you get the feel of things, you can increase the current.

Construction is very easy, thanks to the circuit board supplied by Far Circuits. Not knowing what everyone has in the junk box, I laid the PC board out to use several different styles of the LM317 and diode bridge. Use whatever version of LM317 you have, either in the TO-220 case or the TO-3 case style; BUT NOT BOTH AT THE SAME TIME. The same goes for the diode bridge. You can use either four individual diodes or a bridge rectifier pack from Radio Shack (RS 276-1146), but not both. I prefer the Radio Shack part myself; it's easier to install on the board.

The filter capacitor is also mounted on the PC board this time. A 2200 µF capacitor is used. This value is not especially essential; you can use as low a value as 1000 µF and as high a value as 10,000 µF. The filter smooths out the DC from the bridge so the 555 timer sees a nice smooth Vcc. The 78L12 provides a regulated +12 for the 555 timer. Don't forget to use the bypass capacitors on the 78L12.

Keeping it Cool

The LM317 can get kinda hot. In my prototype, it got too hot. (How hot did it get, Mike?) It got so hot the black heat sink turned silver! It was my fault. I was charging up 24 amp/hour batteries. This was way too much current for the one amp LM317 to pass. I was really surprised that it didn't fry the LM317! One way of generating too much heat is over-sizing the transformer. For 12 volt charging, use only an 18 volt trans-

Parts List for the Pulse Charger

Part	Description
U1	78L12 voltage regulator
U2	555 timer IC
U3	LM317K (or LM317T) adjustable regulator
Q1	2N2222 NPN transistor
D1–D4	1N4001 (or bridge rectifier RS# 276-1146)
D7	1N4001
D5,D6	1N914 diode
C1	2200 µF, 35 V electrolytic, axial
C2,C3	2.2 µF, 35V tantalum
C4,C7	4.7 µF, 35V tantalum
C5,C6	0.1 µF ceramic
R1,R3,R4	2.2k, ¼W resistor
R2	50k potentiometer
R5	220 ohm, ¼W resistor
R6,R7	5k potentiometer
T1	18V at 2A AC transformer

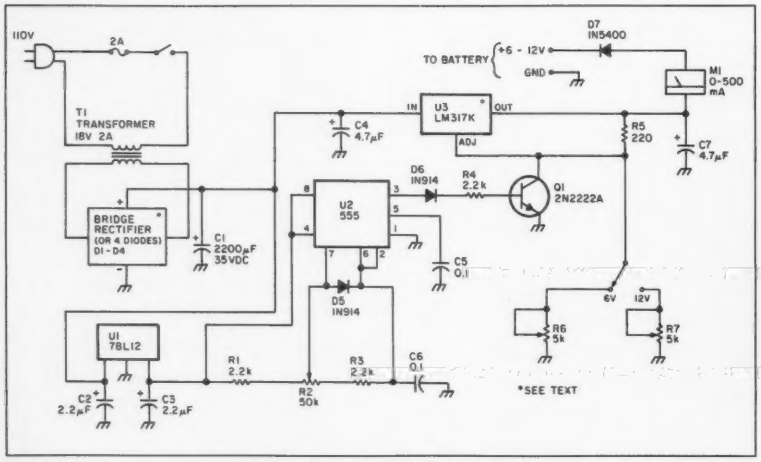


Figure 1. Schematic for the pulse charger.

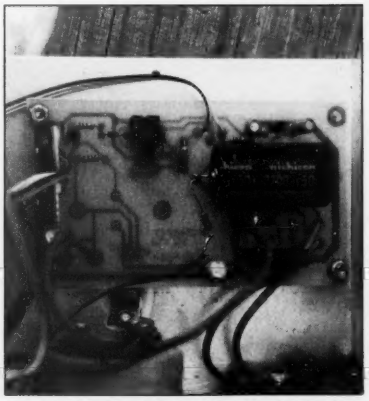


Photo B. Prototype PC board used in charger. Note the extra resistor soldered to the capacitor. Now the resistor is on the board. Just under the larger capacitor, the LM317 is bolted to the metal chassis.

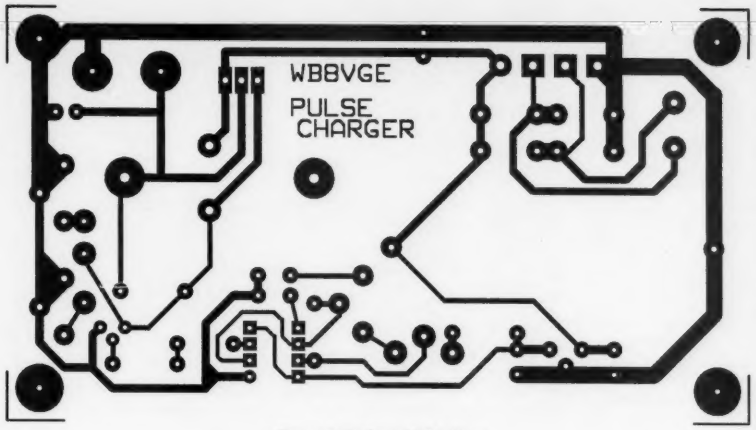


Figure 2. PC board foil pattern.

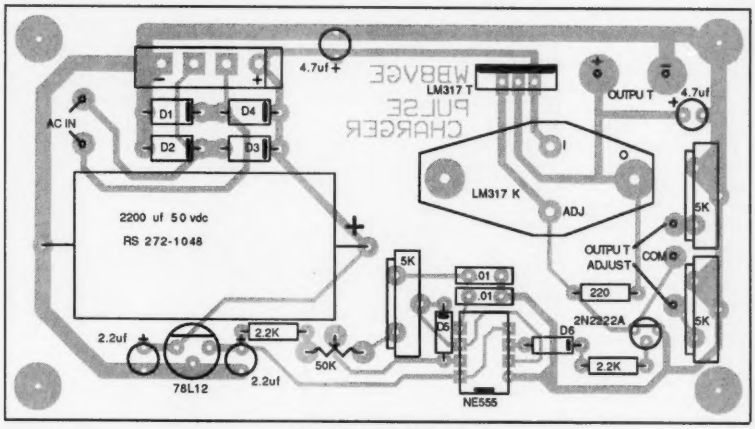


Figure 3. Parts placement.

former, no more. If you regularly charge HT batteries or 6 volt gells, a 12 volt transformer will do just fine.

If you want to charge larger batteries, use the LM350K. This device is good for 3 amps of current. In any case, to keep your charger from becoming your own personal Three Mile Island, you have to heat-sink the LM317. If you use the TO-220 case, you have an easy option. Just use the metal chassis as a heat sink. You have to insulate the case from the chassis, as it is hot. Radio Shack sells a mounting kit for the TO-220 for a buck.

If you go this route, use 1/4-inch spacers for the board, and solder the leads of the LM317 from the foil side of the board. Bend the LM317 back down so it will lay flat against the chassis. Spread some heat-sink compound on both the LM317 and the chassis to improve heat transfer. Don't forget to insolate the LM317 from the chassis. Pre-fit everything before you drill holes into the chassis.

Another option is to use the TO-3 case, LM317. The PC board is big enough to hold it and a heat sink. Because there are many different styles of heat sinks on the market, it's a good idea to make a dry run to be sure everything fits before soldering.

Easy Set-Up

Remove the 555 timer and lay it aside. Apply power to the circuit. Check for +12 volts at pins 8 and 4 of the 555. Select one of the trimmers. Set it for 14.4 volts. Set the other for 7.2 volts. Again, you can set these for whatever value you want or need. If you use the blocking diode, set the voltage on the battery side of the diode. This blocking diode is not on the PC board. You really don't need it, but if you're like me and forget to disconnect the battery and to power down the charger, the battery will discharge into the charger. The diode prevents this from happening.

In the prototype, I used a 0–500 mA meter. I found this to be too small for the batteries I was charging. Use a 0–1 amp meter if you plan on charging 4.5 amp/hour or larger batteries.

Power down the charge and let the caps discharge. Replace the 555 timer. With a battery connected to the output, power up the charger. With the duty cycle control, set the current for proper charging. Remember, the meter will average out the reading from the pulses going to the battery. That's about all there is to do. When the battery becomes fully charged, the current will drop to a very low reading. How much current is flowing when the battery is fully charged depends on the type of battery, battery size, and of course, the battery temperature. Don't use the charger to operate any of your gear!!

Kit Available

To make it easier to get this project going, I can supply a complete kit of parts for the charger. The kit will contain all of the PC board components. There won't be too many of these kitted up, so don't wait too long. Cost of the PC board and parts is $29.95, plus $2.50 for postage.

That should take care of all your portable batteries. No reason to not pick up the HW-9 and head for the woods. Ah yes, QRP; better living with less. 73

COMET
ANTENNAS FOR THE PROFESSIONAL AMATEUR
MULTI-BAND ANTENNA SYSTEMS
146 MHz
446 MHz
DUAL-BAND
NEW (Shown)
Base/Repeater Antenna
GAIN: 146MHz 8.5dB 5/8 Wave x 5
446MHz 11.9dB 5/8 Wave x 12
IMPEDANCE: 50 Ohm
SWR: Less than 1.5:1
144-148 MHz
440-450 MHz
MAX POWER: 200 watts
LENGTH: 17'8"
WEIGHT: 5lbs. 12 oz.
MOUNTING MAST DIA.: 1¼-2½"
CONNECTOR: UHF (SO-239)
CONSTRUCTION: Heavy Duty Fiberglass
SCREW-TOGETHER ABS JOINTS
CF-416
Duplexer w/Coax
CONNECTOR OUTPUT: N-type
146MHz INPUT: UHF
446MHz INPUT: N-type
CF-4160I CF-4160K
Duplexer w/o Coax
POWER: Same as CF-416
CONNECTOR OUTPUT: UHF
146MHz INPUT: UHF
I MODEL 446 INPUT: N-type
K MODEL 446 INPUT: UHF
Call For Your Nearest Dealer Or Catalog
1 [800] 962-2611
N.C.G. CO.
NCG Companies
1275 North Grove Street
Anaheim, CA 92806
(714) 630-4541/FAX (714) 630-7024
CIRCLE 54 ON READER SERVICE CARD

HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors, Inc.
P.O. Box 131646
Staten Island NY 10313-0006

The Dayton Youth Forum

For several months prior to the 1991 Dayton Hamvention, I was concerned about finding dynamic youngsters who were also active hams to speak at the Youth Forum I was going to be moderating there. I was also anxious about how many hams would be bringing their own youngsters with them to the Forum, as we had been publicizing and advertising in all the ham magazines.

Happily, all anxieties were for naught. The Youth Forum got off to a flying start when astronaut Tony England W@ORE stopped by to wish us well, and offered to speak to the standing-room-only audience.

Dr. England was appointed a NASA scientist-astronaut in 1967, and acted as mission scientist for the *Apollo* 13 and 16 flights. He also flew as a mission specialist on the space shuttle *Challenger's* Spacelab 2 mission in 1985. Currently, he is professor of electrical engineering and computer science at the University of Michigan in Ann Arbor. There he both teaches and conducts research on microwave emission, propagation, and scattering.

Tony England enchanted everyone with his stories of how he and his high school ham friends used their knowledge of Morse code to better "communicate" during tests. The audience of more than 60 youngsters, plus all the adults who attended, were privileged to hear Tony speak of his interest in amateur radio as a vehicle to interest young people in science and engineering. With few and progressively fewer bona fide role models for young people in today's society, Tony England made a superb opening speaker for the 1991 Youth Forum at Dayton.

Dynamic Speakers

After such an auspicious introduction, the young speakers had no problem picking up the ball and impressing the audience with their eloquence, composure, and dedication to amateur radio.

The first young speaker on the agenda was **Todd Tittle KF7LX** from Sedro-Woolley, Washington. This personable 17-year-old is an Advanced Class license holder and president of his high school amateur radio club. Todd was secretary and treasurer of the Western Country Cousins Net, for which he also served as net control. His apparent ease at the microphone at a national convention spoke well for his experiences at the radio over the last several years. Todd attributed his original interest in ham radio to his grandfather. He encouraged the young people who were present to pursue different areas of the hobby and have fun with it.

Willis Almekinder KB2LEP is a 15-year-old ninth grader from Lyons, New York. Despite his young age, Willis is a member of RACES, and has used his New York Disaster Preparedness Commission identification card to get past road blocks and into the center of emergencies to offer assistance. He has already made a career choice that will take advantage of his outgoing demeanor. Willis wants to combine an extensive electronics knowledge with an interest in law, and to argue cases that involve high technology. Willis encouraged the youngsters in the audience to consider getting involved with emergency preparedness in their local areas.

Sammy Garrett AA@CR was next at the podium. This articulate 13-year-old from Florissant, Missouri, has an Extra Class license. Sammy and I spent some time together talking at the convention leaving no doubt in my mind about why he was selected the 1991 Westlink Young Ham of the Year. He amazed the audience with his aplomb, and encouraged the adults to share their enthusiasm with the youngsters they wanted to recruit into ham radio. Sammy suggested that we all look for the "little child" in ourselves when speaking to young people. He made an enormously favorable impression on everyone.

Photo A. Astroham Tony England W@ORE got things off to a flying start with Carole Perry WB2MGP at the Dayton Youth Forum.

Photo B. Sammy Garrett AA@CR, the Westlink Young Ham of the Year, encouraging adults to share their enthusiasm with youngsters.

Photo C. Lenny Mack KB8KTC participated in Moonbase America.

Brian Cresenzi KB2GTD, a 14-year-old from Ryebrook, New York, shared his experiences as SAREX (Shuttle Amateur Radio Experiment) net control at Blindbrook High School, New York, for the STS-35 mission last December. Brian made the initial contact that gave students at his school a chance to ask questions of Ron Parise WA4SIR, payload specialist on board the *Columbia*. Brian and his dad, KB2GTE, are members of the Westchester Emergency Communications Association. Someone in the audience commented to me on how wonderful it was for young people to be playing such an active role in some of the most extraordinary events in the world today. Amateur radio has provided an unparalled opportunity for children to become motivated about tomorrow's possibilities in technology.

Lenny Mack KB8KTC is a tenth grader who had the incredible experience of participating in the Moonbase America project during the third week of April 1991. Moonbase America is a national educational project created in conjunction with NASA. Project headquarters is in the Copely-Fairlawn City Schools in Copely, Ohio. Lenny explained that the project is a simulated moon-station constructed out of geodesic domes. Moonbase, designed to provide a lunar environment where students could study science, was located beside the tennis courts of Copely High School. As a command controller, Lenny described how ham radio played a major role in the communications setup of this course for teaching students how to live on the moon, and to appreciate the value of teamwork and individualization. *[See the April "QRX" for more details about Moonbase America.–Eds.]*

All Hopes Fulfilled

I hope never to conduct a youth forum that doesn't include at least one distaff member. Through the generosity of several hams, **Mary Alestra KB2IGG**, a 13-year-old from my class, was able to attend Dayton and speak at the forum. This Extra Class license holder was the 1990 Westlink Young Ham of the Year. She has gone on to be an inspiration for many other young people, especially girls.

It was my profound hope when we began this that the Youth Forum would showcase young people who were accomplished, involved, and having fun in amateur radio. It was a personal honor to be able to bring together such an outstanding representation from across the country. It was clear to anyone in attendance that day that at least some of the not-yet-ham children attending the forum will be considering the possibility of joining our ranks.

Thanks must go to the members of DARA who are always so supportive of educational efforts, and to everyone in the ham community who encourages and lends support to youth-oriented activities, thereby ensuring continued recruitment of bright, energetic, and dedicated young people. 73

1991 CALL DIRECTORY
(On Microfiche)

Call Directory $10
Name Index 10
Geographic Index 10
All three — $25
Shipping per order $3

BUCKMASTER PUBLISHING
Mineral, Virginia 23117
703: 894-5777 800: 282-5628

CIRCLE 7 ON READER SERVICE CARD

THE SOTRON
COMPACT ANTENNAS FROM 160-10 METERS
NO TUNERS
NO RADIALS
NO RESISTORS
NO COMPROMISE
FIVE EXCELLENT REVIEWS JUST DON'T HAPPEN BY CHANCE
CALL US FOR A FREE CATALOG.
*See review in Oct. 73, 1984 *Sept. 73, 1985 March 73, 1986 CQ, Dec. 1988 Mar. W.R. 91

BILAL COMPANY
137 Manchester Drive
Florissant, Colorado 80816
(719) 687-0650

CIRCLE 42 ON READER SERVICE CARD

ROTORS
C.A.T.S.
Rotors, Parts and Repair Service
Reconditioning Large or Small
American Made Rotors
Repairs-$20.00*
Rebuilds-$40.00*
All parts in stock for immediate delivery.
New units for sale. Trade-ins welcome.
C.A.T.S.
7368 S.R. 105 Pemberville, OH 43450
Call N8DJB at (419) 352-4465 10AM–5PM
LABOR ONLY • PARTS & SHIPPING ADDITIONAL
PARTS

CIRCLE 116 ON READER SERVICE CARD

KENWOOD TS-940
Software Enhancement Kit

-**Tuneable Memories** allow you to change the frequency of a memory channel in Memory Mode with the Main Tuning Knob just like a vfo. The new frequency or the memory channel can easily be loaded into the vfo.

-**Memory Bank Selection** is logically performed with the MHZ UP and DOWN keys while in Memory Mode.

-**Main Tuning Knob KHz Per Revolution** is easily set to 1, 2, 5, or 10 kHz to suit your operating style.

-**Microphone Up/Down** keys can be used to change memory channels while in Memory Mode.

Installed by removing chip **IC2** from its socket in the **Digital A Unit** and replacing with the **Giehl Electronics ROM** chip. (Late model TS-940's with serial number 9060000 and higher have no **IC2** socket, thus requiring desoldering of **IC2** and soldering of the **ROM** chip.)

TEN-TEC PARAGON
Software Enhancement Kit

-**Band Registers** store the last used frequency, mode, and filter for all bands 160 through 10 meters.

-**10 Minute Timer** reminds you to ID your station.

-**Single Key Band Selection** makes QSY'ing fast.

-**Main Tuning Knob KHz Per Revolution** is easily set to 1, 1.3, 1.7, 2.5, or 5 kHz to suit your operating style.

-**Dual VFO Offsets** and **Simultaneous Rx** and **Tx** offsets provides flexible frequency control.

-**Up** and **Down** keys are selectable between 1mHz and 100kHz or 10 kHz and 5kHz.

-**Memory Channel** number is preserved for later access.

-**Many Other Enhancements.**

-**Easily Installs in 10 minutes** with no soldering.

Both kits include a new software chip, complete documentation, and installation instructions. **Specify desired kit** and send check or money order for $72.00 + $3.00 shipping/handling to:

Giehl Electronics
P.O. Box 18335, Cincinnati, Ohio 45218

CIRCLE 282 ON READER SERVICE CARD

SHORTY ALL-BANDER

THE PERFECT MATCH FOR ANTENNA TUNERS WITH A BALANCED OUTPUT
ONLY 70 FOOT LONG OVERALL

- Completely factory assembled ready to use
- Small, lightweight, weatherproof, sealed shorteners with stainless steel eyelets
- Heavy 14 (7/22) gauge stranded copper antenna wire to survive those severe storms
- Center fed with 100 feet of low loss 450 ohm balanced transmission line
- Includes center insulator with an eye hook for center support
- Includes custom molded insulators molded of top quality material with high dielectric qualities and excellent weatherability
- Complete installation instructions included
- Overall length 70 feet, less when erected as an inverted vee or sloper
- Handles 2 kw PEP & covers 160 through 10 meters
- May be trimmed to fit small city lots

Only $39.95 PPD

The ALL-BANDER DIPOLE, all-band doublet type antenna is fully assembled, overall length 135 feet with 100 feet 450 OHM feedline

Only $29.95 PPD

G5RV ANTENNA

The **G5RV MULTIBANDER** antenna is an excellent all band (3.5-30 MHz) 102 foot dipole. On 1.8 MHz the antenna may be used as a Marconi type antenna when used with a tuner and a good earth ground. The proper combination of a 102 foot flat-top and 31 feet of 300 ohm KW twinlead transmission line achieves resonance on all the amateur bands from 80 through 10 meters with only one antenna. There is no loss in traps and coils. The impedance present at the end of the 300 ohm KW twinlead transmission line is about 50-60 ohms, a good match to the 70 feet of RG8X mini-foam coax. It comes completely assembled ready for installation, handles 2 KW PEP and may be used in a horizontal or inverted "V" configuration.

MODEL	BANDS	LENGTH	PRICE
G5RV-MB	80-10 (model illustrated)	102'	$49.95 PPD
G5RV	80-10 (no xfmr or cable, with 31' bal. feedline)	102'	$34.95 PPD
G5RV JR	40-10 (no xfmr or cable, with 26' bal. feedline)	51'	$29.95 PPD

AT YOUR DEALER, IF NOT, ORDER DIRECT

VGE
VAN GORDEN ENGINEERING
BOX 21305, S. EUCLID, OHIO 44121
PHONE (216) 481-6590 FAX (216) 481-8329

CIRCLE 120 ON READER SERVICE CARD

CABLE X-PERTS, INC
We stock...Coax, Rotor, Gnd, Pwr, Braid, Magnet Wire, Computer Cables & more
800-828-3340
708-506-1811
For Best Price, Call or Write
1312 Mill Creek Dr., Buffalo Grove, IL 60089

THIS MONTH'S GOODIE FROM THE CANDY STORE
RDC
YAESU
FT-990
UNDER $1995.00

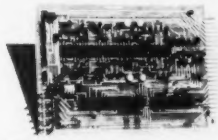
Similar Savings On Kenwood, Astron, Yaesu, Hy Gain, Alinco, Etc. All L.T.O.
MFJ 815B UNDER $46.00
Over 9034 Ham Items in Stock, all Prices Cash FOB Preston
More Specials in HAM ADS. Looking for Something not Listed? Call or Write
ROSS DISTRIBUTING COMPANY
78 S. State Street, Preston, Id. 83263 - Telephone (208) 852-0830
Hours Tue.-Fri. 9-6 - 9-2 Mondays, Closed Sat. & Sun.

CIRCLE 254 ON READER SERVICE CARD

TNT The No-Tune Windom Antennas
No pruning. No tuning. No knobs to twist.
TNT is No-Tune on 80 cw, 40, 20, 17, 12 & 10. TNT/2 is No-tune on 40, 20 & 10. Work other bands w/ tuner. DX & Gain rise w/ frequency.
Ready to Use Now Kink-Proof No Traps or Resistors
Includes Custom Wx-Sealed Insulated to 3000 V
100 ft. RG-8x feedline Low Noise Rated 500 Watts
Call to Order
WindomTechNote #126
$6.95 ppd USA
Info: 801-373-8425
AntennasWest
Box 50062, Provo, UT 84605
TNT Windom 137 ft. long $89.95 -SB P&H
TNT/2 Windom 66 ft. long $79.95 -S7 P&H
Order Hotline 800-926-7373

CIRCLE 135 ON READER SERVICE CARD

THE MULTIPLE RECEIVER SOLUTION



4 Channel Signal-to-Noise Voter

- Expandable to 32 Channel by Just Adding Cards
- Continuous Voting
- LED Indicators of COR and Voted Signals
- Built-in Calibrator
- Remote Voted Indicators Pinned Out
- 4½ x 6 Double Sided Gold Plated 44 Pin Card
- Remote Disable Inputs
- MORE

Built, tested and calibrated with manual
$370.00
Rack mount version also available
For more information call or write:
DOUG HALL ELECTRONICS
Voter Department
815 E. Hudson Street, Columbus, Ohio 43211
(614) 261-8871
FAX (614) 261-8805

CIRCLE 19 ON READER SERVICE CARD

Say you saw it in 73!

Professionally written software by WA7RAI

QUICKYAGI II.....$40.00
•Auto optimizer achieves optimum gain, F/B, and bandwidth in one operation. •Auto and manual design modes. •2 - 12 elements to 500 mhz. •Fastest analyzer available; calculates gain, F/B, and impedances in seconds (instantly w/ co-proc.). •High speed El. & Az. polar plots w/ beamwidth. •Easiest to use of all yagi modeling programs. •Accuracy field tested & verified. •Req. 360k & Hercules, CGA, EGA, or VGA.

AUTOLOG PLUS.....$25.00
•Four programmable on-screen time zone clocks. •Pop-up calendar. •DXCC D-base w/ beam headings. •Prints QSL reports and mailing labels. •Spreadsheet style data entry. •Scrolling log display. •Hot keys for fast programmable auto entries. •Auto tracking cell w/ sort option. •Notepad file with auto date reminder. •Auto call search. •Auto country entry. •QSL tracking. •On screen help. •Search/modify all files. •Too many features to list all. •Req. 256k.

AUTOLOG PLUS II...$45.00
Same as Autolog Plus w/ fully integrated CW keyer. •Loaded with auto features. •Easy no-hassle operation. •Macro keys. •9 programmable Tx buffers. •5-40 wpm. •RS-232 to Tx key interface incl. •Req. printer driver & 360k.

Buy any 2 programs and save $10.00 off total price.

For PC/XT/AT and Compatible.
5.25" & 3.5" floppies. Add $3.00 if outside U.S. and Canada. Az. orders add 5.5% state tax.
CALL SIGN REQUIRED W/ ORDER.

RAI ENTERPRISES, 4508 N.48th Dr.
Phoenix, AZ 85031 USA

CIRCLE 279 ON READER SERVICE CARD

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

AMSAT at Dayton 1991

If you haven't made the trip to the Dayton Hamvention at least once, plan now to attend next year. Over 30,000 hams were on hand for a ham radio convention of gigantic proportions. I thought the Houston gathering was large and the one from Dallas huge, but both paled before the massive assembly of commercial exhibitors, presentations, swapfest enthusiasts and ham participants that took over southwestern Ohio for a long weekend in April.

The event organizers outdid themselves with quick registration, shuttle buses to outlying parking areas and talk-in information on 2 meters, 220 MHz and 70 cm. The convention guide was a full-sized magazine, not just the simple forum list so common at other ham conferences.

AMSAT was well represented with speakers in the meeting rooms and informed volunteers at the booth in the commercial exhibit area. Most of the AMSAT board members and officers attended and were available at the Hamvention to answer questions about the amateur radio satellite program.

AMSAT President and General Manager Doug Loughmiller KO5I spoke at a forum about the successful launches of several new hamsats in 1990. Lou McFadin W5DID and AMSAT Director Tom Clark W3IWI described the Shuttle Amateur Radio Experiment (SAREX) equipment used on board STS-35 and STS-37. Lou showed a tape of amateur television video as received by Ken Cameron KB5AWP on the recent STS-37 mission. Dr. Tony England W0ORE, who took ham radio to space on a shuttle mission several years ago, spoke on the educational benefits of the SAREX operations.

AMSAT Director and Vice President of Manned Spacecraft Operations Bill Tynan W3XO touched on future shuttle and space-station activities, while AMSAT Director Dr. Bob McGwier N4HY discussed the Microsat programs under consideration or construction in several international locations including Mexico, Australia and Italy.

Back at the AMSAT booth, in addition to the excellent advice and help offered by the volunteers, AMSAT had new publications for sale. *Decoding Telemetry from the Amateur Satellites* by G. Gould Smith WA4SXM provides an in-depth look at all the current hamsat telemetry schemes from the simplest CW on AMSAT-OSCAR-21, to the complexities of the University of Surrey satellite systems.

The Satellite Experimenter's Handbook has been completely revised by author Marty Davidoff K2UBC. The result is an updated and expanded reference book for both beginners and longtime hamsat enthusiasts. Although the price is up to $20, this 350-page volume covers all the bases when it comes to satellite chasing.

A Beginner's Guide to OSCAR-13 by Keith Berglund WB5ZDP is into another print run. AMSAT ordered a large batch of these popular booklets to be ready in time for Dayton and for potential sales through 1991. For a bargain $7, you learn how to get a fully-functional station on the air for the high-orbit satellites.

A new Webersat manual was offered in loose-leaf form from Weber State University. AMSAT carries this publication for WSU at $15 per copy. For those looking for more data on the inner workings of Weber-OSCAR-18, this edition provides some useful insight.

No new versions of "Instant Track" and "Quiktrak" were introduced this year. The current software packages continue to outperform many amateur and commercial offerings. In addition to the IBM-PC software, AMSAT carries tracking programs for the Commodore, Macintosh, Apple II, Amiga, Tandy CoCo and HP calculator. Software for the older TRS-80 computers and Sinclair machines is no longer supported.

You can get details on prices of the AMSAT software offerings, and publications can be obtained by calling AMSAT at (301) 589-6062 during normal East Coast business hours. Inquiries can also be sent to AMSAT, P.O. Box 27, Washington DC 20044.

RS-14/A-O-21/ Radio-M1/RUDAK-2

This new amateur satellite has brought back the excitement of easy-to-copy strong signals via Mode B (70 cm up with 2 meters down) from low earth orbit. As one longtime hamsat enthusiast said while making a contact via the transponder, "It's like OSCAR-7 all over again, only 6 dB better!"

From its 620-mile-high orbit, RS-14, also known as AMSAT-OSCAR-21 or Radio-M1 or RUDAK-2, is providing excellent communications to stations not yet fully configured for operation on AMSAT-OSCAR-13's high elliptical orbit. This joint Soviet/German satellite is a part of a Soviet geological research satellite. It offers several modes of operation, but the most promising is the transponder system. Frequency charts were published in the May 1991 "Hamsats" column.

Simple systems with omni antennas can access the analog transponder with SSB and CW with ease. Mobile and portable operation with the clarity of Mode B is now a realistic possibility. While the specifications of the uplink/downlink system appear similar to OSCAR-7 (launched in 1974 and operational through 1980), the signals sound much stronger. This could be a result of many years of high-orbit Mode B transponders on A-O-10 and A-O-13 and the extra effort needed to equip ground stations to receive the weaker signals from orbits ten times higher than A-O-21's.

Advances in receiver performance over the last 17 years and small high-power transmit radios give today's A-O-21 enthusiasts an edge over the homebrew and exotic equipment users of two decades previous.

During late May and early June, experiments were underway to test the systems of A-O-21. Some oscillation problems were noted in the preamp of linear transponder number 1. Linear transponder number 2 was operating normally, but due to the investigations of the complete system, it was not always active. Some even heard it switch off in the middle of a pass without ground-station commands.

The best way to check on the satellite and its functionality is to monitor the CW telemetry. For linear transponder two, the data can be heard on

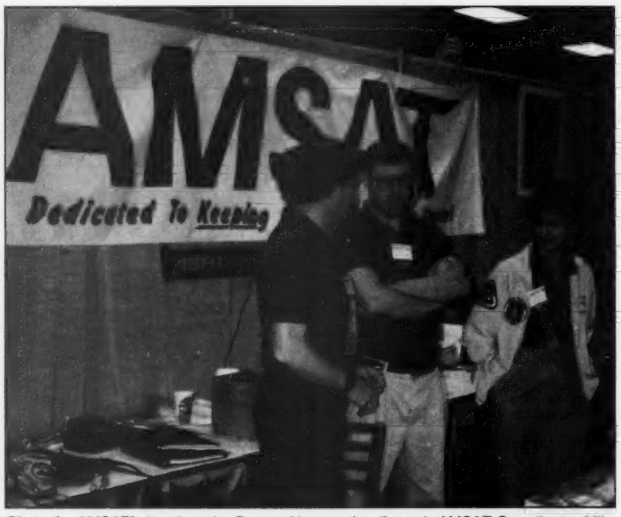


Photo A. AMSAT's booth at the Dayton Hamvention (l. to r.): AMSAT Coordinator Mike Crisler N4IFD, AMSAT President Doug Loughmiller KO5I, and AMSAT Corporate Secretary Martha Saragovitz.

Photo B. AMSAT Executive Vice President John Champa K8OCL answers another question about satellites at the Dayton Hamvention.

145.948 MHz. Decoding the number groups is simple. A typical frame of telemetry consists of eight four-digit numbers.

An actual sample of data copied in late May looked like: PPPPRS14/7007/7116/7224/7316/7409/7500/7600/77. To decode the data, refer to Table 1.

The first four-digit number was "7007." The first digit defines the channel status. A prefix of "6" identifies a general status, while a "2" identifies a command status. The "7" is likely a general status. The second digit, a "0," is the channel number. Channel "0" defines the transponder output. The last two digits give the power level output in watts when multiplied by 0.05. For "07," the result is so close to zero watts that it is assumed the transponder is off. A number in the neighborhood of "80" would give a nominal reading of 4 watts.

The second four-digit number gives the status again as "7," with the channel number as "1." The last two digits, "16," show the transponder power amplifier temperature to be 16 degrees Celsius. If the transponder were on, a higher number with resultant temperature would be expected.

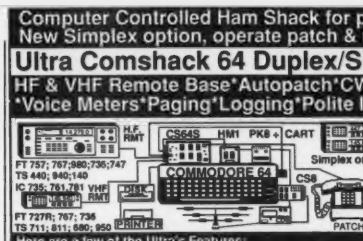
For the remaining channels, the effects are easy to compute. A calculator isn't needed. The numbers directly reflect voltages and temperatures as detected on the spacecraft. Information for decoding the data on channel "7" is not currently known.

The most important number to those wishing to make contacts via the satellite is the value of channel "1." Anything above "40" should reflect active transponder operation. Although DX activity is limited due to the height of the orbit, excellent communications to a few thousand miles range will provide some very satisfying contacts from A-O-21/RS-14. 73

Channel	Parameter	Formula	Unit
0	Transponder Power Output	0.05•N	Watts
1	Transponder PA Temperature	N	Deg. C
2	+24 Volt Regulated Supply	N	Volts
3	+16 Volt Regulated Supply	N	Volts
4	+ 9 Volt Regulated Supply	N	Volts
5	+24 Volt Regulated Supply	N	Volts
6	Inside Temperature	N	Deg. C
7	Engineering Value	N	?

Table 1. CW telemetry decoding parameters.

Computer Controlled Ham Shack for personal or club system
New Simplex option, operate patch & remotes via repeaters!
Ultra Comshack 64 Duplex/Simplex Controller
HF & VHF Remote Base*Autopatch*CW Practice*Rotor Control
*Voice Meters*Paging*Logging*Polite ID's*Packet Voice B.B.S.



Model CS64S
REV 8....$379.95
Includes: C64 interface, disk, cables, Manual
Add $5.00 S/H USA
CA. address add 6.25%
Ask for free catalog!

Here are a few of the Ultra's Features:
Operate duplex or Simplex Load, save, change all from T.tones, Packet, or modem* Unlimited voice vocabulary *Voice clock executes events Daily & Weekly **Super Macros" user programming language! *300-4 digit user access codes *Disk & Printer logging of all telephone numbers dialed, usage time, functions *18 Rotating Polite ID's* 16 External relay controls* 2, 5, & CTCSS Tone Paging* CW Practice with voice *Security mode, T.tone mute* Voice announced user call sign when logging on* Voltage proportional courtesy beeps gives indication of signal strength * 18 rotating Polite ID tails* Safety timers & overrides **Ultra Link" provides T. tone control from remote audio monitored *User defined multi-tone courtesy beeps each mode*Modem or Packet control* 9 T.Tone Macros store 28 digit command strings *2 Talking Meter inputs * Packet or Modem data* Autopatch, Reverse Store 1000 (18 digit) tel. #'s *Quick dial & quick answer * Directed & general page*50 tel #'s restricted patch *Telephone control input* Regenerated touchtones *Autopatch auto off, detects calling party hangup*Pulse or touchtone dial *Call waiting & auto redial* H.F. & VHF Remotes* Dual H.F. & VHF SQ. det *Scan up/down;100Hz step ÷ variable scan rate *Monitor mode defeats PTT*Lock mode allows T. tones to TX through remote *Auto mode & split select *9 Scan memories store Mode, splits, VFO A & B *Talking Meters; Voltmeter * Voice & CW Beacon *Voice Rotor control* User selectable courtesy beep

Ultra Com Shack 64 Options
*Mount All modules including C64, Predrilled & painted incl mounts & cable clamps ALBX .....$ 159.95
*Digital Voice Recorder 32 or 64 sec. voice Mailbox & ID tail, Inc. 1 Meg Ram, control with CS8 or PK8, Incl. cable for REV8 Ultra board, 5 or 12VDC DVM...$ 179.95
*Operate C64 & 1541 from 12Vdc with this crystal controlled Switching supply, runs cool & efficient draws <1 amp. Plugs into C64, fused, protected Model DCPS.....$ 129.95
*Add duplex Control of Remotes & patch with Telephone amplified hybrid, null & gain pots Plugs into CS64S board, TLCN.... $159.95
Autoboot EPROM cart plugs into C64 or PK8, disk or System version CART... $ 109.95
8 relay On/Off; Inc. 3 -DPDT 2 A. relays +5 Sw. outputs. Use with HM1 to rotate beam.....CS 8.....$ 99.95
2 Voice Meters ÷ 2 Alarm Inputs ÷ 8 Relay On/Off Sw. PK8.....$159.95
*PK1 adds Program & Control of Ultra via Packet or Tel line ÷ Packet to Voice BBS, Req. 2nd C64 & PK8, Inc. 4 ft. data cable to PK8.....PK1...$99.95
*Rotor control Analog to digital converter; use with CS8; voice bearing +/- 5 deg. for all rotors HM1..$ 69.95
Ultra Com Shack 64 Manual all schematics, diagrams, how to operate& set up remote base. Refund with purchase of CS64S MN.$25.00

AUDIO BLASTER™ Works in all H.T.'s
AB1S <--Miniature Audio Amp/ Used by police
Module installs inside all H.T's; 1 watt audio amp ! When it needs to be loud! Universal installation diagrams AB1S.... $ 24.95

TSDQ QUAD
TSDQ 4 DIGIT Touchtone Decoder
QUAD Relay Expansion plug-in option
TSDQ use as Repeater On/Off, C64 reset, 8/20 VDC , audio in; Field Program 50,000 Codes; Mom. & Latching; Inc. DPDT Relay; LED digit valid & latch; 24 Pin connector QUAD option adds four 2 Amp. relays ÷ 5 digit on & off code for each relay. 2"X3"
Expandable TSDQ..$ 89.95 Optional QUAD...$ 99.95

Touchtone to RS232 300 Baud Interface "Decode-A-Pad"
Use with all computers
Decodes 16 touchtones
Includes Basic program
Use with any terminal program or write Your own, easy to use!
DAP2 $99.95
IBM Mac C64

*Mastercard*Visa*Amex*Disc
ENGINEERING CONSULTING
583 CANDLEWOOD ST.
BREA, CA. 92621
Tel: 714-671-2009 Fax: 714-255-9984

AC ELECTROMAGNETIC FIELD RADIATION MEASUREMENT

ELF-50D FIELD MONITOR

GENERAL:
The ELF-50D Field Monitor is a low-cost, portable, hand-held instrument designed and calibrated to measure low level 50 Hz or 60Hz electromagnetic field radiation generated by power lines, video display terminals (VDT's), TV sets, home appliances, industrial machinery and other similar devices.
CALIBRATION TRACEABLE TO NIST (PREVIOUSLY NBS).

WALKER SCIENTIFIC INC.
Rockdale Street
Worcester, MA 01606 U.S.A.
Telephone: (508) 852-3674 / 853-3232
Toll Free: 1-800-962-4638
Telex: 9102508517 / FAX (508) 856-9931
Code Name: "WALKER SCI"

CIRCLE 292 ON READER SERVICE CARD

TALK WITH THE KNOWLEDGEABLE PEOPLE AT
QUEMENT ELECTRONICS
FEATURING AN EXTENSIVE LINE OF YAESU PRODUCTS

ALL MODE HF BASE STATION
$3699.00
#FT1000D

YAESU U.S.A.

• FT33R/TTP	220MHZ HT	$328.00
• FT411E	2M HT	$346.00
• FT811	440 MHZ HT	$349.00
• FT470	2M/440 HT	$404.00
• FT911	1200 MHZ HT	$429.00
• FT4700RH	2M/440 MOBILE	$689.00
• FT757GXII	ALL MODE HF PORTABLE	$929.00

IF YOU'RE IN THE BAY AREA, STOP BY!

QUEMENT
1000 S. BASCOM AVENUE
SAN JOSE, CA 95128
Call us at (408) 998-5900
Since 1933

CIRCLE 132 ON READER SERVICE CARD

Hams Around the World

Bob Winn W5KNE
%QRZ DX
P.O. Box 832205
Richardson TX 75083

More DXing Techniques

One of my friends told me recently that he had used what can be considered a bad technique to work a new country. He wasn't necessarily proud of the fact, but after several unsuccessful days of using conventional techniques, he finally broke down and worked the elusive station by "calling out of turn," or "breaking-in." He did this only after he heard another station successfully work the DX station using this technique. This should remind us that there is more than one way to work DX in pile-ups.

Calling on or near the same frequency at the same time as a station working the DX station is considered by many to be rude or unethical. But it is done, and it is too often successful. A more appropriate technique is "tailending."

Tailending means transmitting your callsign on or near the same frequency as the station working the DX station immediately after that station finishes. Tailending is especially successful on CW, and it can be effective in SSB pile-ups as well. But it is not an easy technique to master.

Tailending used against an inexperienced DX operator often causes more problems than successes. A poorly executed tailend does nothing more than QRM the calling station, and more than likely will require the DX station to ask for a repeat, thus slowing his QSO rate. An excellent discussion of tailending is provided by Wayne Mills N7NG in the newly published *Where Do We Go Next?* by Martti Laine and others (KTE Publications, 2301 Canehill Avenue, Long Beach CA 90815). Wayne, an experienced DXpedition operator, shares his experience in Appendix I.

CY9 St. Paul Island

Jan VE2OL reports that a group of amateurs from the West Island Amateur Radio Club (VE2CWI) in Montreal will activate St. Paul Island August 1–7 with the callsign CY9CWI. The list of operators includes VE2SEI, VE2WHO, VE2JBF, VE2DAV, VE2PTT, VE2GZV and VE2OL. Three stations will be active during this operation. The following frequencies have been mentioned: CW—1820, 3520, 3680, 7040, 14050, 21110 and 28050 kHz; SSB—1870, 3795, 7060, 14195, 21295 and 28495 kHz. CY9CWI will also be active on the WARC bands. QSL via VE2CWI.

St. Paul Island sits in the Gulf of St. Lawrence just off the northeast coast of Cape Breton Island, Nova Scotia. Outside of Nova Scotia, few know about it — encyclopedias don't even mention it, and the usual know-it-all geographical dictionaries merely mention its location. But to many residents of Nova Scotia, and to those people who have been there, St. Paul Island is remembered as the graveyard of the Gulf of St. Lawrence.

As many as a thousand deaths have been attributed to the rocky embraces of the island. One of the first recorded shipwrecks was of the English transport *Royal Sovereign*, which was carrying troops home from the war of 1812. Of the 311 men on board, only a dozen or so survived. In 1825 the Canadian barque *Jessie* ran aground on the island during a snowstorm. The crew was able to get ashore, but they died of starvation.

The island, which actually consists of two islands and several rocks, resembles an exclamation mark (!). It's three miles long and averages 1-1/4 miles in width. It is currently inhabited by two lightkeepers who stay on the island for 28 days. Around 1900 there were as many as 40 people living on the main island. There was a post office, a cannery, a school and a telegraph office. The lighthouses were first built in 1838.

The main island, heavily wooded with stunted spruce, is about two miles long. The island on which the lightkeepers live (and DXers operate!)—the dot of the quotation mark—is about two acres in size and about 40 feet above high water. Lighthouse keeper Mel Tanner describes it as "this desert island of ours." Tanner also mentioned that the island is ". . . surrounded by a rough, rugged shoreline so exposed to disturbances that we are constantly overcast in spray during winds of any velocity."

Yuri Blanarovich VE3BMV, writing about the XJ3ZZ/1 DXpedition in the November 1977 issue of *CQ*, had the following to say about St. Paul. "St. Paul lies 18 miles northeast of the northern end of Cape Breton Island. It is small, rocky, and practically desolate. The northern point is a detached pinnacle, which appears from seaward to be joined to the main island, but it is separated by a narrow channel about 100 feet wide from the peninsula. The main part of the island rises in two parallel ranges of hills, the southeast being the higher with a summit of 485 feet. . . .

"There are two lighthouses on St. Paul, one on the detached rock forming its northern extreme, and another on its southern point. . . . The only access to the small island is through the channel separating both islands, and only by small boat. Wooden platforms and walkways abound over the island. It is very difficult to walk on the island during bad weather, as the rocks are slippery and dangerous, but walkways connect all buildings on the island." Yuri also mentioned that "the expedition was not what you would call a pleasure trip, but hard work. . . ."

St. Paul Island (CY9DXX QSL card), prefix (CY9).

St. Paul Island qualified as a separate DXCC country based on "separate administration." St. Paul, like Sable Island, was administered by the Federal Department of Transportation. This was established by an act of Canadian Parliament as part of the Canadian Shipping Act.

There have been several DXpeditions to St. Paul since it was added to the DXCC list of countries. The first signed the special callsign VY0A. Other operations included XJ3ZZ/1, VE1CR/1, CY0SPI, CY9SPI, CY9DXX, W5KNE/VE1 and CY9CF. The callsign CY0SPI was issued to the island to be used by ALL operations, but without any obvious reason the licensing authorities changed it to CY9SPI. The island callsign for Sable Island was changed from CY9SAB to CY0SAB at the same time. (Adapted from an article by W5KNE published in the August 1, 1988 issue of *QRZ DX*.) See the photo.

British Virgin Islands (VP2V)

Arch K8CFU, who will be visiting the islands August 16 through 25 with his wife, will be active as VP2V/K8CFU. Look for him on 20 meter SSB. QSL to Arch's *Callbook* address.

Greenland (OX91)

Laurent F6GOX (ex-TK5BL and FJ5BL) is a member of a scientific expedition scheduled to be in Greenland during July and August. Laurent should be active on the HF bands as OX91REF. The callsign of his 6 meter beacon on 50.100 MHz is OX91BCN. QSL via F6AJA.

DXing How-to Books

There have been several excellent DXing how-to books published in recent years, but the two that I believe are the best for new DXers are *The Complete DX'er*, by Bob Locher, W9KNI and *The DXCC Companion* by Jim Kearman KR1S.

Jim's book brings the beginner into the hobby of DXing at an easy pace and Bob's book, written in an interesting narrative style, sharpens the techniques.

Both books are available from major ham radio book outlets. You might want to check "Uncle Wayne's Bookshelf" in this issue of *73*, too.

New Islands-On-The-Air Directory

The new *IOTA Directory*, all 50 pages of it, is now available. It includes a fully updated list of islands to work for the IOTA Awards program and fully revised IOTA rules. Price: Europe—$10 or 15 IRCs; other countries—$12 or 18 IRCs. Send requests to IOTA Director Roger Balister, G3KMA, La Quinta, Mimbridge, Chobham, Woking GU24 8AR, England. 73

TOUCH TONE DECODER:

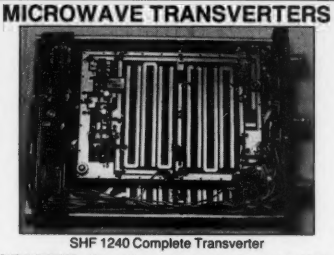
Decodes DTMF tones from audio source, (tape, phone, radio). Displays numbers on LCD display, 120 Digit memory. $169.00 ppd. U.S.A. SURVEILLANCE/-COUNTERSURVEILLANCE catalog $5.00.

T-2000

EMCOM
10 HOWARD ST. BUFFALO NY 14206
(716) 852-3711

CIRCLE 173 ON READER SERVICE CARD

MICROWAVE TRANSVERTERS



SHF 1240 Complete Transverter

SHF SYSTEMS No tune linear transverters and transverter kits for 902, 1269, 1296, 2304, 2400, 3456 MHz. All use 2m i.f.g13.8V. Kits include mixer and L.O. P.C. boards, xtal and all components. Built units include I.F./D.C. switchboard, connectors and compact low profile housing. Other frequency options in amateur band available.

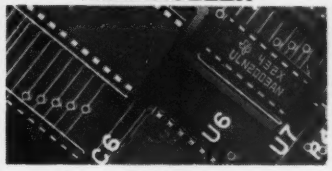
SHF 900K	902-906 MHz	50mW	Kit $139	Built $265
SHF 1240K	1296-1300 MHz	10mW	Kit $149	Built $265
SHF 1269K	1268-1272 Oscar Mode L	10mW	Kit $140	Built $255
SHF 2304K	2304-2308 MHz	10mW	Kit $205	Built $325
SHF 2401K	2400 MHz Mode S rcv Conv		Kit $155	Built $255
SHF 3456K	3456-3460 MHz	10mW	Kit $205	Built $325
SHF LOK	540-580 MHz L.O.	50mW	Kit $ 66	

CALL OR WRITE FOR COMPLETE CATALOG

DOWN EAST MICROWAVE

Bill Olson, W3HQT
Box 2310, RR1 Troy, ME 04987
(207) 948-3741 FAX: (207) 948-5157

SRC-10 REPEATER/LINK CONTROLLER



- DTMF muting
- Intelligent ID'er
- Auxiliary outputs
- Easy to interface
- Alarm monitor input
- Telemetry response tones
- Low power CMOS, 22ma @ 12v
- Detailed application manual
- Programmable COS polarities
- Repeater & link courtesy tones
- Synthesized link/remote base capability

$149.00 *Assembled & Tested*

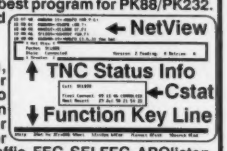
CREATIVE CONTROL PRODUCTS
3185 Bunting Avenue
Grand Junction, CO 81504
(303) 434-9405

CIRCLE 146 ON READER SERVICE CARD

PktGOLD MultiMode

PK232, PK88 Owners !!
Your upgrade is here.

Features: Direct Maildrop support, Binary File transfers, Conference bridge, Continuous monitoring even while connected, DOS shell, Advanced Scroll back, Cut and paste editor, and more. Simply the best program for PK88/PK232. Online command and mode help.



AMTOR: PK232 owners, Amtor has never been so easy to use. On screen you see whether you are sender or receiver, RQ or traffic, FEC, SELFEC, ARQlisten, etc. If you have a PK88, and upgrade to the PK232, you'll find AMTOR operation as easy as Packet using our "quick connects" system and other operating tools. The best program for Baudot, Morse, Navtex, TDM, Ascii and SIAM, the AEA Signal Analysis mode.

Read the AEA advertisement "Many superior programs have been written for Host Mode" Know what program they're talking about? If you guessed PktGOLD, you're right!

Ordering: Price: $59.95 (CA add Tax) plus $5 S&H. InterFlex Systems Design Corp., P.O. Box 6418, Laguna Niguel, CA 92607-6418 (714) 496-6639 VISA/MasterCard welcome.

CIRCLE 77 ON READER SERVICE CARD

BATTERIES

Nickel-Cadmium, Alkaline, Lithium, Sealed Lead Acid For Radios, Computers, Etc. And All Portable Equipment

YOU NEED BATTERIES?
WE'VE GOT BATTERIES!

CALL US FOR **FREE** CATALOG

E.H.YOST & CO.
7344 TETIVA RD.
SAUK CITY, WI 53583
(608) 643-3194
FAX 608-643-4439

CIRCLE 114 ON READER SERVICE CARD

Where's the Beam?

Unobtrusive DX Gain Antennas for 80 thru 10
• Easily hidden • Install Fast • Fixed or Portable •

There's a 20 meter antenna with real DX Punch hidden in this picture. You can't see it, and your neighbors can't either. But it works DX barefoot anyway. How about a low profile 80/40/30 tri-bander? Or a 2 element monobander for the attic? All easily fit the pocketbook--Priced $29 to $99.

Work DX without telling the neighbors

Infopack $1 *AntennasWest*
Box 50062-R, Provo, UT 84605 (801) 373-8425

CIRCLE 90 ON READER SERVICE CARD

HI-PERFORMANCE DIPOLES

Antennas that work! Custom assembled to your center freq. ea. band - advise ht. of center and each end - hang as inverted "V" - horizontal, vert. dipole, sloping dipole - commercial quality - stainless hardware - legal power - no-trap, high-efficiency design. Personal check, MO or C.O.D. ($3)

MPD-5*	80-40-30-15-10M max-performance dipole 87' long	$105ppd
MPD-2	80-40M max-performance dipole, 85' long $82	95' $66 ppd
HPD-3*	160-80-40M hi-performance dipole 113' long	$79 ppd
SSD-6*	160-80-40-30-15-10M space saver dipole 71' long	$125 ppd
SSD-5*	80-40-20-15-10M space saver dipole specify L. 42' $105	52' $106 ppd
SSD-4*	80-40-20-15M space saver dipole specify L. 46' $93	60' $ 96 ppd

*5-bands with wide-matching-range tuner.

SASE for catalogue of 30 dipoles, slopers, and space-saving, unique antennas

708-394-3414 BOX 393 W9INN ANTENNAS MT. PROSPECT, IL 60056

CIRCLE 38 ON READER SERVICE CARD

D & L FABRICATION

MAXRAD State of the Art Antennas **Antennas by:**

MAXRAD INC. and AUSTIN ANTENNA LTD.

	MAXRAD CHROME COIL SERIES	
MHB-5800	5/8 wave 3dB 144–174 MHz	24.64
MUF-4305	5/8 over 1/2 wave 430–450 MHz 5dB	26.08
MDB1444	146/446 Dual Band unity/5dB	31.95
	MAXRAD MOLDED COIL SERIES	
MHB-150	5/8 wave 144–174 MHz 3dB Economy model	22.96
BMHB-150	5/8 wave 3dB 144–174 MHz all black	28.24
MUF-430	5/8 over 5/8 wave 430–450 MHz 5dB	24.40
BMUF-430	5/8 over 5/8 wave 430–450 MHz 5dB black	29.78
	MOUNTS	
M	3/4" body mount with coax and PL259	10.95
T	Trunk lip mount with coax and PL259	15.08
G	Chrome magnet mount	19.11
RG	Chrome magnet mount with rubber boot	20.50
BG	Black magnet mount	20.98
RBG	Black magnet mount with rubber boot	22.38
	AUSTIN ANTENNA LTD.	
500C	144/446 Dual band	29.95
Suburban	144/223/446 tri-band base station	69.95
Triplexer	144/223/446 MHz	130.00
DF Q'er	144 MHz Fiberglass base station	64.95
	440 MHz Fiberglass base station	59.95

Antennas From 50MHz through 1.3GHz. We support 220 MHz
Phone Hours: Monday through Thursday 06:00 to 08:00 PM CST
Order Line: 1-800-533-5160 Information: 1-913-677-4766
D & L FABRICATION, P.O. BOX 6784, LEAWOOD, KS 66206
Shipping extra. No extra charge for Mastercard, Visa, Discover

**** KENWOOD HF OWNERS ****

Do you have RS232 remote control hardware?
Been disappointed by the software you've tried?

INTRODUCING TS-MOUSE

If you can point and click with a mouse, you are already an expert with TS-MOUSE.

POWERFUL, YET EASY TO USE

Adds nearly unlimited memory capacity to your transceiver.

Performs searches for names, time, location or any other file information.

Select the stations around your current frequency by simply pointing and clicking.

Quick and easy Memory Management and Control of your transceiver.

Will use your computer system resources up to its highest capability, from a standard PC with a monochrome display to a '486' machine with Super-VGA 60 row Color.

Package includes a file of popular frequencies.

HARDWARE REQUIRED:
IBM PC or Compatible with a Mouse.

TS440s, TS850s, TS940s or TS950s with RS232 interface.

$39.95 Total Price. We pay standard shipping.

LINEAR LOGIC (602) 820-5162

CIRCLE 76 ON READER SERVICE CARD

Commodore REPAIRABLE POWER SUPPLIES™

1.8 AMP Output $24.95*	Your Choice of C-64	4.3 AMP Output $37.95*

SAME OUTSTANDING FEATURES

- 1 Year Warranty
- Completely Repairable
- External Fuse
- Schematic included
- UL Approved
- A MUST for all Commodore owners
- Utilizes Large Transformer
- Does Not Run Hot
- Plugs Directly into Any C64 Commodore Unit
- 4.3 AMP Unit Used For Add-Ons, Peripherals, Multiple Drives, or Packet Radio.

•This Will Be the Last C64 Power Supply You Will Ever Purchase•
•Over 52% of C64 Failures Were Due to Power Supply Malfunctions•
(The C128 Version Power Supply Costs $45.50, Plus UPS)

•NEW FREE CATALOG JUST OUT•

Call for your NEW FREE 36 page catalog of specialty items for Amiga, Commodore and IBM. The catalog contains low cost replacement chips, parts, upgrades, 34 diagnostic products, tutorial VHS tapes, interfaces, complete power supply line and other worldwide products YOU WON'T find anywhere else.

We stock all Commodore replacement/upgrade chips. (including Amiga)

THE GRAPEVINE GROUP, INC.
3 Chestnut St.
Suffern, NY 10901

914-357-2424 FAX 914-357-6243
We Ship Worldwide 1-800-292-7445 Prices Subject to Change

CIRCLE 192 ON READER SERVICE CARD

THE RF CONNECTION

"SPECIALIST IN RF CONNECTORS AND COAX"

Part No.	Description	Price
PL-259/USA	UHF Male Phenolic, USA made	$ .70
83-1SP-1050	PL-259 Phenolic, Amphenol	.89
83-822	PL-259 Teflon, Amphenol	1.75
PL-259/ST	UHF Male Silver Teflon, USA	1.50
UG-175	Reducer for RG-58	.20
UG-176	Reducer for RG-59 & MINI 8	.20
UG-21B/U	N Male RG-8, 213, 214, large body	5.00
9913/PIN (now in gold)	N Male Pin for 9913, 9086, 8214 fits UG-21D/U & UG-21B/U N's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	3.95
UG-21B/9913	N Male for RG-8 with 9913 Pin	5.75
UG-146A/U	N Male to SO-239, Teflon USA	6.00
UG-83B/U	N Female to PL-259, Teflon USA	6.00

"THIS LIST REPRESENTS ONLY A FRACTION OF OUR HUGE INVENTORY"

THE R.F. CONNECTION
213 North Frederick Ave. #11W
Gaithersburg, MD 20877

ORDERS 1-800-783-2666
INFO 301-840-5477 FAX 301-869-3680

PRICES DO NOT INCLUDE SHIPPING
PRICES SUBJECT TO CHANGE
VISA, MASTERCARD, ADD 4%
UPS C.O.D. ADD $4.00 PER ORDER

CIRCLE 115 ON READER SERVICE CARD

Say you saw it in 73!

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35¢ a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the *Barter 'n' Buy*, Sue Colbert, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

CHASSIS, CABINET KITS SASE, K3IWK, 5120 Harmony Grove Rd., Dover PA 17315. BNB259

CLASSIFIED RADIO Buy/Sell/Trade. Advertise FREE, pay only if equipment sells, $15 max! Twice monthly. Easy to read! Subscriptions only $12/yr. Free Samples, ad line 1 (800) 553–9175. POB 245-S, Jonesboro GA 30237. BNB263

HOME-BREW PROJECTS lists for S.A.S.E. Kenneth Hand, P.O. Box 708, East Hampton NY 11937. BNB264

TRANSISTORS RF FOR SALE: Looking for repair shops, manufacturers and dealers. MRF454, MRF455 series TOSHIBA 2SC2290, 2SC2879, and more. Call (800) 842–1489. BNB265

ANTIQUE RADIOS, tubes, wiring diagrams, & literature, send 2 stamps to VRS, P.O. Box 541 (ST), Goffstown NH 03045 for large list. BNB266

HAM RADIO REPAIR CENTER, quality workmanship. Solid state or tube, all makes and models. Also repair HF amplifiers. A-Z Electronic Repair, 3638 East, Indian School Rd., Pheonix AZ 85018. (602) 956–3024. BNB267

QSL CARDS- Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept A, 310 Commercial, Emporia KS 66801, or FAX request to (316) 342–4705. BNB434

ROSS' $$$$ NEW August (ONLY) SPECIALS: LOOKING FOR THAT HARD TO FIND ITEM?? KENWOOD SM-230 $844.90, TH-26AT $285.00, TH-75A $399.00, TM-631A $620.00, TS-450S $CALL, TS-850SAT $1,609.90, TS-940SAT $1,999.90, TS-950SAT $3,329.90; MFJ 815B $45.90, 948 $104.90, 986 $239.90, 1270B $129.90; HEATH KIT HW-2P $279.99; NYE VIKING MB-V-A $644.90, MBI-02 $179.90; ROHN 45AG1 $159.90, 25G $83.90; TELEX HY-GAIN CD-45II $229.90, 188S $233.90; YAESU FT-311RM $369.90, FT-650 $1,349.90, FT-709R $289.99, FT-747GX $689.90; ICOM 229H $379.50, 24AT $389.90, 28H $419.90, 27A $369.90, 3200A $459.99. SEND S.A.S.E. FOR USED LIST. ALL L.T.O. (LIMITED TIME OFFER) LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE. Over 9039 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. PRESTON. HOURS TUESDAY–FRIDAY 9:00 TO 6:00, 9:00–2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB654

SIMPLE LABEL PROGRAM Easy to use IBM/IBM compatible. Send $10.00 with $2.00 S&H to Emil Kubanek W8BVR, 6298 Old Allegan Rd., Saugatuck MI 49453. BNB691

ROSS' $$$$ USED August SPECIALS: KENWOOD TS-440S/WAT $1,089.90, TL-922A $1,399.90, SP-230 $65.90, AT-230 $199.90, TS-830S $799.90, VFO-230 $309.90; TEN-TEC 225 $99.90, 229B $249.90, 260 $139.90, 562 $1,699.90, 960 $189.90, FT-301D $379.90, FT-747GX $629.90, FTV-650B $169.90, FT-411 $249.90, FP-301 $109.90. LOOKING FOR SOMETHING NOT LISTED?? CALL OR SEND S.A.S.E., HAVE OVER 185 USED ITEMS in stock. MENTION AD. PRICES CASH, FOB PRESTON. HOURS TUESDAY–FRIDAY 9:00 TO 6:00, 9:00–2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB709

HAM RADIO REPAIR Experienced, reliable service. Robert Hall Electronics, 1660 McKee Rd., Suite A, San Jose CA 95116. (408) 729–8200. BNB751

WANTED: Ham equipment and other property. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of ham radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Please look over whatever unwanted equipment you may have, and cll us. We will pick up or arrange shipping. You will receive the tax deduction, but most important, the privilege of knowing that your gift really made a difference in the education and upbringing of a child. Meet us on the WB2JKJ CLASSROOM NET, 1100 UTC on 7.238 MHz, and hope to see you at the SOUTHWESTERN DIVISION CONVENTION in August. Write us at: The RC of JHS 22 NYC, INC., P.O. Box 1052, New York NY 10002. Round the clock HOTLINES: Voice (516) 674–4072, FAX (516) 674–9600. BNB762

"HAMLOG" COMPUTER PROGRAM Full features. 18 modules. Auto-logs, 7-band WAS/DXCC. Apple, IBM, CP/M, KAYPRO, TANDY, CR8 $24.95. 73-KA1AWH, PB 2015, Peabody MA 01960. BNB775

LAMBDA AMATEUR RADIO CLUB International amateur radio club for gay and lesbian hams. On-air skeds, monthly newsletter, and annual gathering at Dayton. (215) 978–LARC. P.O. Box 24810, Philadelphia PA 19130. BNB812

INEXPENSIVE HAM RADIO EQUIPMENT. Send postage stamp for list. Jim Brady—WA4DSO, 3037 Audrey Dr., Gastonia NC 28054. BNB890

GREAT CIRCLE MAP custom plotted in four colors, centered on your QTH. 22" x 24". Countries identified by prefix. Plastic laminated. $35 ppd. Vector Control Systems, 1655 No. Mountain Suite 104-45, Upland CA 91786. Tel. (714) 985–6250. BNB900

BATTERY PACK REBUILDING: SEND YOUR PACK/48HR SERVICE. ICOM: BP2/BP3/BP22 $19.95, BP5/BP8/BP23 $25.95. BP24/BP70 $26.95, BP7 $32.95. KENWOOD PB21 $15.95, PB21H/PB6 $22.95, PB25/26 $24.95, PB2/PB8 $29.95. YAESU: FNB9 $19.95, FNB10/17 $23.95, FNB11 $29.95, FNB3/4/4A $36.95. STS: AV7600 $27.95, ZENITH/TANDY LT PACKS $54.95 "U-DO-IT INSERTS" ICOM: BP3/BP22 $16.95, BP5/8/24/70 $21.95. KENWD: PB21 $12.95, PB21H $18.95, PB24/25/26 $19.95, TEMPO/S $22.95. YAESU: FNB9 $16.95, FNB10/17 $18.95, FNB4/4A $32.95. AZDEN: $19.95. "NEW PACKS": ICOM BP8B (BS CHG) $32.95. SANTEC: 142/1200 $22.95, YAESU: FNB2/500 $19.95, FNB2/600 $23.95, FNB17 $34.95, FREE CATALOG. $3.00 Shipping/order, PA+6%, VISA-M/C +$2.00, CUNARD, R.D.6 BOX 104, Bedford, PA 15522. (814) 623–7000 BNB913

WANTED: BUY & SELL All types of Electron Tubes. Call toll free 1 (800) 421–9397 or 1 (612) 429–9397. C & N Electronics, Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB915

COMMODORE 64 HAM PROGRAMS—8 disk sides over 200 Ham programs $16.95. 25¢ stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. Home-Spun Software, Box 1064-BB, Estero FL 33928. BNB917

JUST IMAGINE your own beautiful Blue Ridge mountain top QTH—selling my 323-acre Christmas tree farm—all or part—trees optional. KK4WW, Floyd VA. (703) 763–3311. BNB956

CUSHCRAFT, Barker & Williamson, power supplies, rotors, baluns, center insulators, ladder line, coax, connectors, surplus tubes. ATKINSON & SMITH, 17 Lewis St., Eatontown NJ 07724. 1 (800) 542–2447. BNB957

FREE Ham Gospel Tracts, SASE, N3FTT, 5133 Gramercy, Clifton Hts. PA 19018. BNB960

PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook.* List SASE. FAR Circuits, 18N640 Field Ct., Dundee IL 60118. BNB966

SATELLITE MONTHLY AUDIO CODES 1 (900) HOT-SHOT. Intended for testing only. $3.50 per call. BNB976

AZDEN SERVICE by former factory technician. NiCds $36.95 plus shipping. Southern Technologies Amateur Radio, Inc., 10715 SW 190 St. #9, Miami FL 33157. (305) 238–3327. BNB979

COMMODORE 64 REPAIR Fast turn around. Southern Technologies Amateur Radio, 10715 SW 190th Street #9, Miami FL 33157. (305) 238–3327. BNB982

TRAVEL! HIGH INCOME! Radio officers needed for shipboard employment. Must have FCC Second Class Radiotelegraph license and background in electronics. Salary approximately $4,000 monthly to start, including vacation plus full benefits. Rae Echols, W7FFF, American Radio Association, 5700 Hammonds Ferry Road, Linthicum Heights MD 21090. BNB983

IT'S BACK AND BIGGER THAN EVER: THE HW-8 HANDBOOK. Modifications for the Heath HW series of QRP rigs. A must for every QRPer. $7.95 plus $1.00 for first class postage, or DX $14.95 air, to Michael Bryce WB8VGE, 2225 Mayflower NW, Massillon OH 44647. BNB984

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur radio and electronics PD software, $4.00 per disk. Send 2-stamp SASE for catalog. Specify which computer! WA4EFH, Box 1646, Orange Park FL 32067-1646. BNB992

VIDEOCIPHER II/Scanner/Cable/Satellite modification and repair books. Catalog, $3.00. TELECODE, P.O. Box 6426-PE, Yuma AZ 85366-6426. BNB994

COMPONENTS QRO–QRP LSASE KA7QJY, Box 7970, Jackson WY 83001. BNB995

DIPOLES CUSTOM MADE for your frequency. Information SASE. Beacon Hill Antenna Works, 201 Coach House Drive, Madison WI 53714. BNB996

SURPLUS Huge quantities. Lowest prices in America. Catalogs, $3. Surplus Traders, Box 276, Alburg VT 05440. BNB997

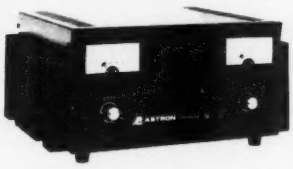
NEW RADIO BUFFS SPECIALS: AMERICA'S BEST: TEN-TEC OMNI-V $1850.00, PARAGON $1850.00, NEW DELTA $1399.00, ARGONAUT QRP $1199.00, 961 POWER SUPPLY $219.00, HERCULES II $1190.00, TITAN $2635.00, AUTO TUNER $899.00; JAPAN RADIO CO. JRC 135HP $2499.00, JRC 135 STANDARD $1599.00, NRD 525 $999.00, NRD 535 $1599.00; ASK FOR PRICE ON ALL ACCESSORIES. WE ALSO CARRY ICOM, MFJ, B&W, AMECO, COMET, KLM/MIRAGE, SPI-RO, SANGEAN, AOR SCANNERS, and many more amateur items. CALL HENRY N4EDQ at RADIO BUFFS AMATEUR RADIO SALES, or write: 4400 HIGHWAY 19A, MOUNT DORA FL 32757. TEL. 1 (800) 828–6433; AFTER HOURS, FAX 1 (904) 589–5576. OUR STORE HOURS ARE: MON thru FRI, 10 A.M. till 5 P.M. EST. BNB998

MOTOROLA REPEATERS (solid state) $200, Motorola signal generators (T1034B) 25–960 MHz $250, VHF mobiles $90, antennas, test equipment, etc., ask for list. Have several of each. Rene VE6WCA. Ph/Fax (403) 436–3427. BNB999

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •



MODEL VS-50M

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

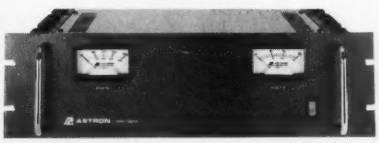
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



RM SERIES

MODEL RM-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• 19" RACK MOUNT POWER SUPPLIES				
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

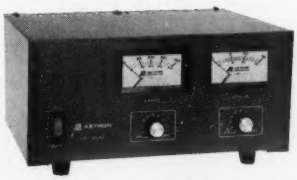
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES



MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake
San Diego CA 92119

Lasers and Photomultiplier Tubes

It has been a year since the FET switcher AC power inverter appeared in this column—August 1990, in fact. The basic switch driver has been used in quite a few different applications. The photomultiplier tube (PMT) covered this month uses a modified version of this power supply to deliver the high voltage required for proper operation. The PMT is a sensitive detector used in the receiver portion of the system. Now for a little about the power supply and PMT requirements.

PMTs and Gain

The laser receiver described last month used a low voltage pin diode. Further improvements can be made by using a PMT with higher sensitivities. The pin diode circuit is modified by removing the first op amp to prevent too much gain from the PMT. In the end I used a single op amp tied directly to the LM386 audio amplifier. Steve Noll WA6EJO used an LM387 in his system, and experimentation proved him correct. The modifications are due to the fact that PMTs are much more sensitive when compared to photo diodes. In fact, PMTs have gains (current amplification) that run in the millions!

Photomultiplier tubes are electron tubes that receive light (a stream of photons) and convert it to electric current. A photo cathode, the first element of the tube, intercepts the light, then emits electrons (or, if you prefer, repels electrons because it's intercepting positive photons) towards the first dynode.

This first dynode is more positive than the cathode, and attracts the electrons. However, due to electron bounce, when electrons hit the dynode, they collide with other electrons on the dynode and join the original electrons at some exit angle. They are attracted by the next dynode (more positive) before they can return to the first dynode. See Figure 1. You might also use the old pool-table analogy to visualize all this activity. This process continues through nine successive dynode stages, providing very high current gains for a very small input signal.

Electron bounce happens in every electron tube, but a grid type structure near the plate, called the suppressor, is tied to the cathode potential. It repels electrons, sending them back to the plate and reducing secondary emissions. In the PMT, the opposite is required in order to obtain current gain.

PMTs can be so sensitive that when they are used for very low light applications, such as astronomy, they are contained in magnetic shields, and cooled to very low temperatures. The magnetic shielding limits external forces affecting the electrons as they are reflected internal to the tube's elements (dynodes), and maximizes performance.

As you can see in Figure 2, the internal construction of the dynode is different in the various types of PMTs. Some types are: the Side-On, the Head-On (compact, with fast response; like the 931), the Box-and-Grid (generally provides best uniformity and sensitivity), and the Venetian Blind (high output, slow response time). All of these PMTs work very well, as time response is not a critical factor for our applications.

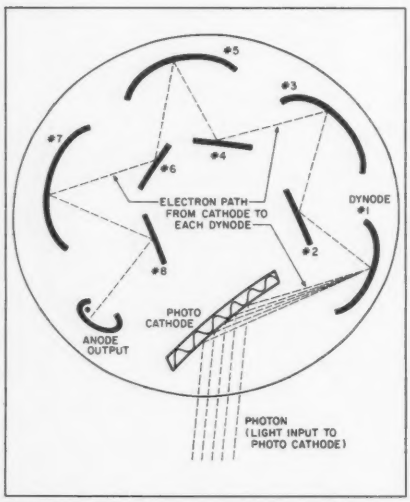


Figure 1. The 931 photomultiplier (PMT), showing current path from photo cathode (light input) to each dynode involved in current amplification. Current gain is very high.

The 931 and similar types of PMTs require a power supply voltage near 1000 volts, and 2 to 3 mA of current for the tube and resistor network. The power supply connections for a 931 PMT are shown in Figure 3. This resistance network is usually contained in a well-insulated tube socket base.

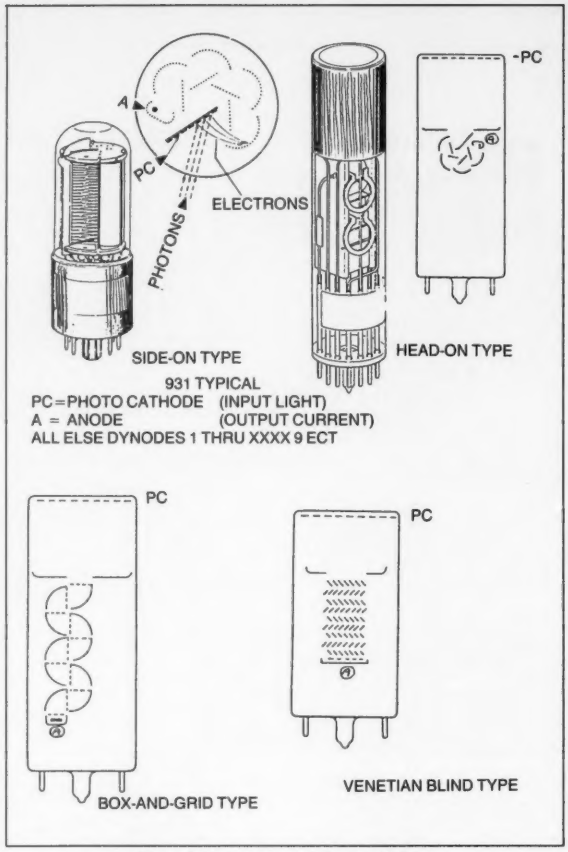


Figure 2. Various types of photomultipliers.

The change to the circuit is minimal. With a PMT, all you need is a high voltage capacitor coupling the PMT's output to the detector's audio preamplifier circuit. A high voltage capacitor is necessary since PMTs operate at a potential around 1 kV, and you don't want high voltage leading into the low voltage audio circuit.

The Power Supply

The PMT power supply uses the basic switch driver coupled with a hand-wound toroidal step-up transformer to produce a home constructed 1 kV power supply at a few mA. The power supply application was covered in detail in the August 1990 column. *[Ed. note: See the May 1991* Updates *section for the schematic.]* In that application, a 24 volt center-tapped transformer was used, driving it backwards, which made the primary the 110 volt AC output. Depending on the current rating of the 24 volt winding, you could obtain 100 or so watts of power at 110 volts AC from this simple system. In our application, the 24 volt transformer is replaced with a home-wound toroid step-up transformer.

The construction of a power supply meeting the PMT's voltage requirements fit well with the FET switcher design. What was desired was a system to operate from 12 volts for portable operation. Construction on a step-up transformer was started by winding a ferrite bobbin (cup core transformer). The cup core type was selected due to the ease of winding a high number of turns required for the secondary. The secondary was wound by hand, and a very small transformer resulted. By using a ferrite cup core transformer, the entire unit can be constructed in a very small container.

The ferrite bobbin/core can be ordered new or obtained in surplus. The transformer construction uses a single ferrite cup core that is about an inch and a half in diameter and an inch high. The cup core transformer is constructed of two identical ferrite halves that sit on top of each other and contain an internal plastic bobbin. This bobbin is removed to facilitate rapid winding. Compared to a toroid, the bobbin can be more easily wound.

The bobbin (transformer) is very similar to a sewing machine bobbin. I was able to wind a primary of 54 turns center-tapped #24 gauge wire with a layer of insulating Mylar and transformer tape (to isolate the primary from secondary) in about three minutes. The secondary required about 1800 turns of #36 gauge wire to obtain the 1 kV needed for the PMT. A small gauge

HUGE NEW CATALOG ...WITH PRICES!

➤ *Big 92 page 8½ x 11" Format*

- Communications Receivers
- Portable Receivers
- Scanners
- Amateur HF Transceivers
- VHF-UHF Transceivers
- HTs and Mobiles
- Amateur and SWL Antennas
- Accessories and Parts
- RTTY and FAX Equipment
- Books and Manuals

Send $1 to

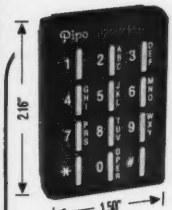
Universal Radio
1280 Alda Drive Dept. 73
Reynoldsburg, OH 43068
Tel. 614 866-4267

HIGH SPEED SIGNALLING > **DTMF** >
- ANI
- MEMORY DIAL
- STORE & SEND

STEEL KEYS
SEALED GOLD CONTACTS

An ultra high quality DTMF Encoder for absolute reliability and function.

- Software-Driven and Keyboard Programmable
- High Capacity, 30 Digits per Location • Side Tone
- Non-Volatile Memory • Auto Test & PTT Disable
- 5-10-20 DPS, Pure Signalling—No "Pops"
- Speed Adj • Pause Adj • Digit Expand • Wait/Send
- Wide Operating Range: -22 +160°F / 6-26 VDC
- Multi-Function Programming .....*



PK-7V, ANI3.2
PK-7H Horiz. Model

* Call or write for ANI3.2 Info

PK-1K, ANI3.2
W/Relay

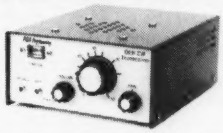
Mail Order To:

Pipo Communications
Emphasis is on Quality & Reliability

P.O. Box 2020
Pollock Pines, California 95726
(916) 644-5444
FAX: 644-PIPO

CIRCLE 66 ON READER SERVICE CARD

PORTABLE QRP CW TRANSCEIVER
DEC. '90 & JAN. '91 QST BY GARY BREED K9AY



Features: SINGLE-SIGNAL receiver, VFO tuning, AGC for listening comfort. 5 Watts output, Semi-QSK TR switching and CW sidetone. Add a battery, key and antenna and you're on the air. FULL 100% KIT including a custom pre-painted punched and lettered metal enclosure. 20, 30 and 40 Meter available.

Complete Kit Only $159.95

CA Residents add 6.5% sales tax.
S&H $5.00 (insured). Foreign orders add 20%.
For more info or price list send legal size SASE.

VISA **A&A Engineering** MasterCard

2521 W. LaPalma #K • Anaheim, CA 92801 • 714-952-2114

CIRCLE 109 ON READER SERVICE CARD

Budget QSLs
$39/1000
plus $3.75 Shipping in U.S.

★ **RAISED PRINTED** ★

BEAUTIFUL, GLOSSY INK!

Thought you couldn't afford really good QSLs? These high quality RAISED PRINTED cards can be in your hands for only 4¢ each! Your choice of 4 colors of 67 lb. bristol stock: Gray, Yellow, Blue, Ivory. We print in blue ink in the format shown. If you don't want the state outline, we can remove it and make the callsign larger to balance the card. NO EXTRA CHARGE for ARRL logo, or extra wording if we have the room. Order with confidence; these are the best value in Ham Radio today! Your satisfaction is guaranteed. Send your check or call us if you have MasterCard or Visa.
Need a custom card? Call (318) 443-7261.

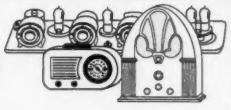
DENNIS WA5QMM

NETWORK QSL CARDS

P.O. Box 13200 - Alexandria, LA 71315-3200 - (318) 443-7261
or FAX your order to: (318) 445-9940

CIRCLE 44 ON READER SERVICE CARD

FREE SAMPLE COPY!



ANTIQUE RADIO CLASSIFIED

Antique Radio's Largest-Circulation Monthly Magazine

Articles - Classifieds - Ads for Parts & Services
Also: Early TV, Ham Equip., Books, Telegraph, 40's & 50's Radios & more...

Free 20-word ad each month. Don't miss out!

VISA 1-Year: $27 ($40 by 1st Class) MasterCard
6-Month Trial - $15. Foreign - Write.

A.R.C., P.O. Box 802-E7, Carlisle, MA 01741

Model WLA24M
5-1000 MHZ PREAMPLIFIER

For analyzers, scopes, radio/TV, ICOM R-7000, scanners, etc. Gain 23 dB, Noise Fig. 3 dB, Pout (1 dB) 18 dBm, 12-15 VDC. Usable 2-1100 MHz, with input protection, in cast aluminum case. Pull signals from noise. Only $119 + $4.

WI-COMM ELECTRONICS INC.
P.O. Box 5174, MASSENA, N.Y. 13662
(315) 769-8334

CIRCLE 63 ON READER SERVICE CARD

★★★★ PRESENTING ★★★★
CABLE TV DESCRAMBLERS
★★★★★ STARRING ★★★★★
JERROLD, HAMLIN, OAK
AND OTHER FAMOUS MANUFACTURERS

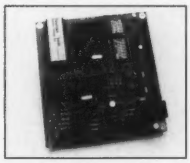
- FINEST WARRANTY PROGRAM AVAILABLE
- LOWEST RETAIL/WHOLESALE PRICES IN U.S.
- ORDERS SHIPPED FROM STOCK WITHIN 24 HRS.
- ALL MAJOR CREDIT CARDS ACCEPTED

FOR FREE CATALOG ONLY 1-800-345-8927
FOR ALL INFORMATION 1-818-709-9937

PACIFIC CABLE CO., INC.
7325½ RESEDA BLVD., DEPT. 1854
RESEDA, CA 91335

CIRCLE 178 ON READER SERVICE CARD

Natural Voice Playback Board



- Repeater Identifiers
- Contest Stations
- Site Alarms
- Remote Telemetry
- Weather Stations
- Multiple Languages
- Emergency Announcements

DataVoice - DV-64

Add a *Recorded Natural Voice* to your system or equipment. Voice vocabularies or multiple phrases up to 1 minute in a Natural Voice is saved in Non-Volatile E-Prom memory.(If power is removed the recordings will not be lost). We'll record your message(s) in a male or female voice - or - you can record the library by using the optional SDS-1000 development board on an IBM or compatible computer.

Parallel Input Word Select	8 ohm Audio output
500 ma Keyline Output	600 ohm Audio output
32 Kb sampling rate	+9v to +14v Supply
Multiple Modes	Size : 4.00" x 4.25"
30 sec - 30 minute Timers	Connectors Included

Price $ 169.00 Single Qty (programmed)

Palomar Telecom, Inc.
300 Enterprise St. Suite E
(619) 746-7998

CIRCLE 264 ON READER SERVICE CARD

Omar Electronics Inc.
Rt. 1 Hwy. 81 South
Loganville, GA 30249
(404) 466 -3241

Omar WA8FON		Marc N4YHM
AEA	MFJ	ARRL
Alinco	Kenwood	Bencher
Ameritron	Yaesu	ICOM
Pro-Am	Uniden	Van Gorden

SUPPORT RESEARCH.

It Works Wonders.

American Heart Association

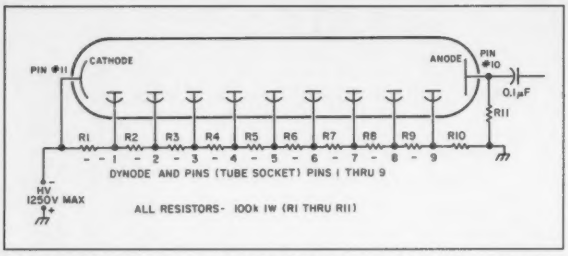


Figure 3. Schematic diagram of a 931 PMT, showing resistor network and high voltage.

wire is used for the secondary, since the PMT's current there is only 1 to 2 mA. The wire gauge is not critical.

In the initial test transformer, I scramble-wound the secondary in one large coil. I have to admit I lost count several times on the exact number of turns, but it was close to 1800. Normally I would have laid a layer of tape every 200 turns or so to give voltage flashover protection on the secondary, but I didn't do this to the trial transformer.

The enamel wire should be good to 1 kV, but why push it as I did with the prototype? When finished I had plenty of room for the six or so layers of Mylar insulating tape, which would hold voltage to lower limits in each separated winding bundle. Other insulating material can be used.

it, as it can draw quite an arc that I don't wish to be near. Just use good insulation procedures and good construction techniques, and keep you hands out of it when it is on. Can't say it enough: SAFETY FIRST.

Mailbox

Joe Foss USN on the *SS Cleveland* writes that he found an old copy of *73* in Subic Bay R.P. He enjoyed the article covering the 30 MHz IF amplifier used in the receiver for 10 GHz microwave wideband FM. He wanted to build one, but knew that Radio Shack doesn't stock the main ingredient—the TDA-7000 chip. Well, Joe, the chip comes with the kit along with a few other parts that I can muster up to help defray costs. It's amazing how many of these

Once the transformer was completed, I found that due to an error in winding (turns ratio) I had too much output voltage for a current draw at 2 mA. I could have opened up the transformer and removed turns, but I decided it would be better to put a voltage regulator in the switching input circuit, and regulate the DC voltage. This way I could set the output voltage to compensate during test evaluations for different type of tubes. A minor variation, but part of the prototyping game.

All that was required was an LM317 adjustable voltage regulator. I set the voltage to the 9 to 10 volt range for input to the switcher and obtained 1 kV output with ease. A small pot controlled the DC regulated voltage. The LM317 required a heat sink, as it was passing a half amp of current at 12 volts for this circuit, but that's a small price to pay for such easy voltage control. I ran the prototype for three hours, and it did not falter. I did detect some transformer heating, but this was slight, as with the switching FETs. I am always suspicious of something that works the first time.

NOTE: Use caution with this power supply, as it can deliver a lethal jolt! Always keep safety in mind when working with high voltage. Do not think that just because it provides only a small current it is not serious. THINK AGAIN! If you need proof, this baby will provide

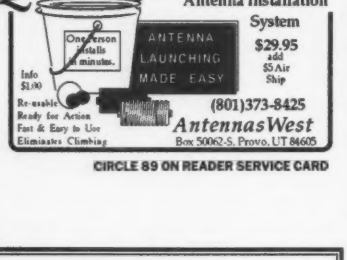
simple kits have surfaced on the microwave bands since the first article went out. I still use mine, and it did not have a PC board, being the prototype. Cost of the kit is still $10 postpaid.

Steve Caesar KF8LW is planning several microwave beacons using simple keyed CW oscillators for the bands 450 MHz and up (the 70cm, 35cm, and 23cm ham bands). I supplied a beacon CW IDer for the project.

Junji Tamura JH1MNOY obtained a phase-locked brick from me and reports it arrived safely in Japan. He was very happy to find some SMA connectors and voltage regulators in the package. These are difficult to get in Japan, he says. When Junji completes the negative 20 volt power supply, the brick oscillator will be tested in the lab at the Japan Amateur Radio League. I set the brick up for 10.0040 GHz to use with a 430 MHz SSB radio for operation on 10.475 GHz, their portion of the band.

I am gathering components for a weather satellite receiver operating on 1691 MHz, and I'll report on that when time permits. As always I will be glad to answer questions concerning microwave or related topics. Please include postage (SASE) for a prompt reply. Those without return postage will go unanswered, but may be answered in the column. Best 73s, Chuck WB6IGP.

QRV-QL Quick-Launch Antenna Installation System



$29.95 add $5 Air Ship

(801)373-8425

AntennasWest

Box 50062-S, Provo, UT 84605

CIRCLE 89 ON READER SERVICE CARD

HAM RADIO SOFTWARE

FOR IBM, COMMODORE, MACINTOSH

LICENSE STUDY - CODE PRACTICE - ANTENNA DESIGN - CIRCUIT DESIGN - WEATHER - SATELLITE TRACKING - COMPUTER AIDED CONTROL (CAT) - CW - RTTY- PACKET - SLOW SCAN TV - PROPAGATION PREDICTION - GENERAL QSO LOGGING - CONTEST LOGGING - DX UTILITIES - VHF/UHF/uWAVE DESIGN - TRAFFIC HANDLING - PUBLIC SERVICE - ELECTRONIC REFERENCE - WORLD TIME - FACSIMILE - BASIC LANGUAGE PROGRAMS - GAMES - EGA/VGA GRAPHICS - ADULT GRAPHICS - GIF - HURRICANE TRACKING W/STORM LIBRARY - MORE

FREE 50 PAGE CATALOG & IBM DISK - US/CANADA $1 FIRST CLASS
FOREIGN AIR MAIL $2 OR 5 IRC - REFUNDED 1st order (US ONLY)

HAM-SOFT

PUBLIC DOMAIN SOFTWARE FOR AMATEUR RADIO

P. O. BOX 2525

MORGAN CITY, LA 70381

(504) 395-5655

CIRCLE 260 ON READER SERVICE CARD

ZD ENGINEERING PRESENTS

★★★★ THE CATV ★★★★

HARDLINE MATCHING TRANSFORMER

The ZD Engineering quarter-wave matching transformer is designed to provide an accurate and broadbanded impedance match between very low loss 75 Ohm CATV hardline and a 50 Ohm load. In addition it provides a reliable and inexpensive method of attaching type N or SO-239 connectors.

Matching transformers are built for the following frequencies.

144 MHz, 222 MHz, 440 MHz, 903 MHz, and 1296 MHz. Units below 200 MHz are built with type N or SO-239 connectors while all others are built with type N only.

Units are built to fit 1/2, 3/4 and 7/8 inch hardline.

Custom built transformers are available for any frequency between 100 MHz and 1.3 GHz as are units built to fit other sizes of hardline. When ordering, please include a 4 inch section of your hardline and specify the design frequency and connector type you need.

Price for 144 MHz units is $29.95 per pair plus $5.00 shipping UPS. 222 MHz , 440 MHz, 903 MHz, and 1296 MHz units are $27.95 per pair plus $5.00 shipping UPS. Ohio Res. add 5.5% sales tax. Custom built prices on request.

Units may be obtained from:

ZD ENGINEERING

Paul H. Darwactor W8ZD

605 Balsley Avenue., Findlay, Ohio 45840

PHONE 419-424-8765

TODAY'S THE DAY

Stop Smoking.

American Heart Association

PAY TV AND SATELLITE DESCRAMBLING ALL NEW 1991 EDITION

Our best yet. The very latest in descrambling circuits, bypasses, turn-ons for cable, wireless and satellite. Only $14.95. Other pay TV editions, Vol. 1 (Basics of All Systems) $14.95. 1989 Edition $14.95. Build satellite systems under $600 $12.95. Wireless Cable Handbook $9.95. Any 3/$29.95 or 5/$44.95. Scrambling News Monthly has all info on the new "Plain Vanilla" descramblers which emulate B-Mac, VCII, Plus and Orion. $19.95/yr. All new catalog $1.

Scrambling News, 1552 Hertel Ave., Buffalo, NY, 14216. COD S ARE OK. (716) 874-2088

CIRCLE 36 ON READER SERVICE CARD

How many times have you been hit...

and didn't know it?

LSC-10

LIGHTNING STRIKE COUNTER

Shunts tower, coax, pipe, etc. • Water tight-strike powered. • See if grounding/protection is making a difference! • Available for power/phone lines too.

PolyPhaser CORPORATION

2225 Park Place / P.O. Box 9000 / Minden, NV 89423-9000
(800) 325-7170 / (702) 782-2511 / FAX (702) 782-4476

CIRCLE 258 ON READER SERVICE CARD

HIGH PERFORMANCE PRESELECTOR-PREAMP

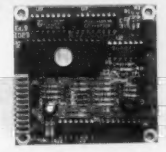
The solution to most interference, intermod, and desense problems in repeater systems.

- 40 to 1000 Mhz tuned to your frequency
- 5 large helical resonators
- Very high rejection
- Low noise—high overload resistance
- 8 db gain—ultimate rejection >80 db
- GaAs fet option (above 200 Mhz)
- Cast aluminum enclosure
- N, BNC, and SO239 connector options

Typical rejection:
±600Khz @ 145 Mhz: 28db
±1.6 Mhz @ 220 Mhz: 40db (44db GaAs)
± 5 Mhz @ 450 Mhz: 50db (60db GaAs)
±20 Mhz @ 800 Mhz: 65db
±20 Mhz @ 950 Mhz: 70db

AUTOMATIC IDENTIFIERS

- Up to 8 EPROM programmed messages
- Adjustable audio, speed & interval timer
- "ID over voice inhibit"
- Low power option
- Modular design
- Message selection via binary input—TTL levels
- Size: 2.7 x 2.6 x 0.7"



NEW Model ID-2B

The ID-2B provides required station identification without troublesome diode programming. The "ID over voice inhibit" circuitry allows for courteous operation by not allowing an ID until the next squelch closing.

ID-2B Wired/Tested $99.95 **ID-2B-LP Low Power $109.95**

GLB ELECTRONICS, INC.

151 Commerce Pkwy., Buffalo, NY 14224
716-675-6740 9 to 4

CIRCLE 17 ON READER SERVICE CARD

UPDATES

Number 19 on your Feedback card

Micro ATV Transmitter

See the above article in the July '91 issue, page 9. Although the Micro ATV Transmitter will work as shown in the article, there are a couple of changes that will improve its performance. There is one error in the original schematic. As shown in the original article, the video clamping circuit will not function. This could cause sync loss (an unstable picture) during wide variations of scene illumination. To correct this, note the new location of the 1k resistor R9 (see Figure 1). Remove the chip resistor R9 from the bottom side of the circuit board and add a standard 1k, ¼W resistor to the top side. This new resistor R9 should go from the junction of diode D1 and potentiometer R8 to ground (see the new parts placement diagram—Figure 2).

Note that the polarity of capacitor C7 was reversed in the original parts placement diagram. The correct configuration is shown here in Figure 2. Also when using the corrected circuit, you should increase the value of capacitor C7 to 100 µF with a 10 volt rating. Mouser part# 140-MLR10V100 is recommended for C7. One final note: when installing the MRF-911 transistor, make sure that the collector lead points towards the RF out connection. 73

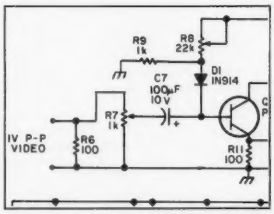


Figure 1. Corrected schematic for the Micro ATV Transmitter. Note new placement of R9.

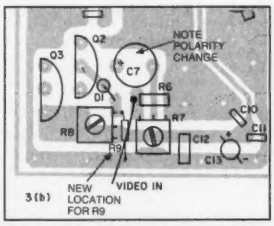
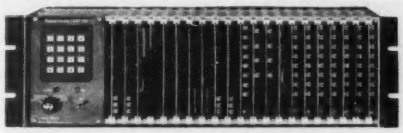
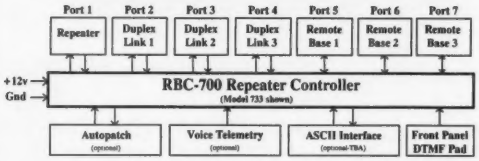


Figure 2. Correct parts placement for the Micro ATV Transmitter. Remove chip resistor R9 from the bottom of the board, then solder a 1k, ¼W resistor to the top of the PC board as shown. Note also the correct polarity of capacitor C7.

MULTIPLE REPEATER - LINK - REMOTE BASE CONTROLLER

Finally a controller that has solved control and audio interconnect problems between multiple radios. Your radio system can grow to multiple sites and stretch for hundreds of miles - and yet any radio can be fully controlled from any designated input.





The RBC-700 Repeater Controller is designed to support Repeater systems that require multiple radios connected together at a site. The RBC-700 utilizes a true 7 x 7 audio matrix switch which allows several conversations between ports at the same time. In the illustration above the 733 model is supporting a Repeater, 3 Duplexed Links to different sites, and 3 Remote Bases. Using simple commands, a user could tie the Repeater and a Remote Base to one Link, while the other Links are communicating through your site, holding separate conversations. Or, connect all of the ports together - like a big party line !!

Several models are available and are software configurable to support up to 3 Repeaters, 5 Duplexed Links, and 4 Remote Bases. A group or club can start with the basics and **expand** their controller anytime by simply adding boards and software. Free software upgrades for one year after delivery. Finally, a real controller for the Linked system operator !

Multiple Independent Repeater control
Up to 5 Duplexed Links
Up to 4 different Remotes
Recorded Natural Speech Telemetry
Programmable Macros
Connect / Disconnect multiple Ports
Internal Receiver Squelch processing
Easy servicing
Intergrated Autopatch
Expand at any time
Programmable Scheduler
+10v to +14v Supply
Standard 5.25" Rack Mount
Card-Cage design

Palomar Telecom, Inc.
300 Enterprise St. Suite E • Escondido, Ca. 92025 • (619) 746-7998 • Fax (619) 746-1610

CIRCLE 264 ON READER SERVICE CARD

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603–525–4438) for listings that were too late to get into publication.

AUG 2

CAMILLUS, NY VE Exams will be held at the Town of Camillus Municipal Building beginning at 7 PM. Test fee for Technician through Extra is $5.25. Talk-in on 147.300. Please bring two forms of ID and a copy of your license. Contact ***John Patchett KB2ERJ, (315) 487–0298.***

AUG 3

HANCOCK, MI The Copper Country Radio Amateur Assn., Inc. will host the 1991 Upper Peninsula Hamfest at the Houghton County Arena. A banquet will be held Sat. eve. at the Ramada Inn in Houghton, following the Hamfest. For info on tables call ***(906) 337–5537***, or write to ***Howard D. Junkin N8FHF, Publicity Coordinator, Copper Country RAA, PO Box 217, Dollar Bay MI 49922.***

AUG 3–4

JACKSONVILLE, FL Eight Amateur Radio clubs of the Greater Jacksonville area will combine efforts to present the 18th annual Greater Jacksonville Amateur Radio/Computer Show at the downtown Prime Osborn Convention Center. Swap tables. FCC Exams and Auction will be held on Sun. Admission $5. Reserved swap tables are $15 for the weekend. Fri. set-up is 2–7 PM; Sat. set-up is 7–9 AM. Open for the general public from 9 AM–5 PM Sat., and 9 AM–3 PM Sun. To order advance tickets, send an SASE with payment to ***Greater Jacksonville Amateur Radio & Computer Show, PO Box 10623, Jacksonville FL 32207.*** Swap tables may be ordered via ***PO Box 11882, Jacksonville FL 32239***. For exhibitor info write ***PO Box 9673, Jacksonville FL 32208.***

AUG 4

CROOKED LAKE, IN The Second annual Land of Lakes Angola Hamfest will be held at Steuben County 4-H Park from 6 AM–2 PM. Camping available. Free parking. Walk-in VE Exams. Advance tickets $3, $4 at the door. Table charge $5; trunk sales $2. Contact ***Land of Lakes Angola Hamfest, PO Box 465, Fremont IN 46737.***

PEOTONE, IL The Hamfesters Radio Club, Inc. will sponsor their 57th Hamfest/Computer Festival at the Will County Fairgrounds from 6 AM–3 PM. Overnight parking. Set-up Sat. $10 plug-in fee by Fairground. Exhibits open at 8 AM. Advance tickets $4, $5 at the gate; under 12 years free. Talk-in on 146.52 and 146.76–. Contact ***David F. Brasel NF9N, 7528 W. 109th Place, Worth IL 60482. (708) 448–9432.***

AUG 10

LOS ALTOS HILLS, CA The Perham Foundation will sponsor an Electronics Flea Market at Foothill College Parking Lot "C". Sellers $10 per vehicle (2 spaces); buyers free. Call ***(408) 255–9000*** for Exam info. Talk-in on 144.67/145.27 MHz SPECS repeater. Campus parking rules are enforced! Please park legally.

BEND, OR The High Cascade Hamfair, sponsored by Central Oregon Radio Amateurs, will be held indoors at Mt. Bachelor Sunrise Lodge from 9 AM–4 PM. 2 meter foxhunt, VEC Exams, commercial exhibits. Advance tickets $5, $7 at the door. Flea Market space $2; $10 with table. Reservations required. Overnight area for self-contained RVs. No hook-ups or tents. Preregistration deadline is June 30th. Talk-in on 147.060 (+600). Contact ***Jack Ulstead N7DDS, PO Box 506, Sisters OR 97759. (503) 549–9480.***

AUG 10–11

HUNTSVILLE, AL Huntsville Hamfest 1991 will be held at the Von Braun Civic Center. Round-the-clock security provided. Free electricity in each booth. Huntsville Hilton directly across the street. Contact ***Huntsville Hamfest, Inc., 2804 S. Memorial Pkwy., Huntsville AL 35801.***

AMARILLO, TX The Panhandle ARC will sponsor the P.A.R.C. Golden Spread Hamfest. Tickets $6 in advance, $7 at the door. Tables $5. VE Exams both days. Wheelchair accessible. Talk-in on 146.920, 146.940 and 146.670. Contact ***P.A.R.C., PO Box 1524, Amarillo TX 79105***, or call ***Troy Reno, (806) 358–5906.***

AUG 11

ST. CLOUD, MN The St. Cloud ARC Hamfest will be held at the Whitney Senior Center on Northway Dr. Donation $4. Talk-in 34/94 primary; 615/015 secondary. Contact ***SCARC, Box 141, St. Cloud MN 56302.***

WARRINGTON, PA The Mid-Atlantic ARC Hamfest will be held at the Bucks County Drive-In Theater on US 611. Set-up at 7 AM. General admission at 8 AM. Admission $3; $2 for each tailgate space. Talk-in on 147.66/.06 and 146.52. Contact ***Al Maslin W3DZI (215) 446–4936.***

PAULDING, OH The Paulding County AR Group and Modern Woodmen of America Ins. Co. will co-sponsor a Hamfest at Paulding County Fair Grounds beginning at 8 AM. To register for License Exams, send an SASE and a check for $5.25 payable to ***Bob High, 12838 Tomlimson Rd., Rockford OH 45882.*** For Flea Market info contact ***Allan Helle, (419) 263–3093***, or ***Jerry Rhodes, RR 2 Box 1582, Paulding OH 45879, (419) 399–4507.***

CEDAR RAPIDS, IA Cedar Valley ARC will sponsor the Cedar Rapids Summerfest at Teamsters' Hall, 5000 J St. SW. VE Exams. Free tailgating. Commercial exhibits. Admission $4 at the door. Tables $12 w/power, $10 without. To reserve tables, send an SASE with check payable to ***CVARC, c/o V. Wilcox KB8DNA, 3122 Sue Land NW, Cedar Rapids IA 52404.*** Talk-in on 146.745 repeater.

AUG 17–18

BREWSTER, NY PEARL, The Putnam Emergency and Amateur Repeater League, will hold "PEARLFEST" at the John F. Kennedy Elementray School on Foggintown Rd. VE Exams. Commercial Exhibits. Fox-hunts. ARRL table. Admission $4. Dealer tables $10 in advance. Tailgaters $7. Talk-in on 145.135 –600. Contact ***Joel Rappaport WA2AWG, Box 216, RR2, No. White Rock Rd., Holmes NY 12531. (914) 855–1672.***

ITHACA, NY The Tompkins County ARC is presenting the Finger Lakes Hamfest and Computerfest on Sat., August 17, 1991, at the New York State Armory, Ithaca, NY. Vendors will be offering both new and used equipment, and there will be a large paved flea market area. VE testing is available by preregistration. Send 610 forms to NK2V, P.O. Box 4704, Ithaca NY 14852. Admission is $3 in advance, $4 at the door. Under 18 free. Indoor tables $6, outdoor spaces, $2. Breakfast and lunch will be served. Indoor spaces should be reserved and paid for by July 15. N.Y. Army National Guard equipment displays. For more information contact ***Ross Boyer, N2ISU, T.C.A.R.C., P.O. Box 4144, Ithaca, NY 14852-4144.***

SHREVEPORT/BOSSIER CITY, LA The Shreveport ARA will sponsor a Hamfest at the Bossier City Civic Center. Astronaut Steve Nagel N5RAW, STS-37, will be guest speaker. Admission $3. Talk-in on 147.03/.63. Contact ***Ric Crouch N5QML, 3201 Knight St., Apt. 2508, Shreveport LA 71105. (318) 865–0313.***

MOBILE, AL The Mobile ARC will sponsor a Hamfest at Abba Shrine Temple from 8 AM–4 PM Sat., and from 8 AM–3 PM Sun. Admission $3, ladies free. Tables $12 (200 available, pre-registered only). VE Exams Sun. at 9 AM. Bring two ID's (1 photo) plus original license and copy, and $5.25. Contact ***N4EM***. Talk-in on 146.82/.22; contact ***Marc, PO Box 9315, Mobile AL 36691*** or ***Jess Ferguson N4HPL, (205) 957–6674, PM.***

AUG 18

TOWSON, MD The Moose ARC will sponsor a Hamfest at the Towson Moose Lodge. Admission $3, tailgating $5, inside tables $10. Doors open at 8 AM. Talk-in on 224.12, 224.16, 145.13, 145.33 repeaters. Contact ***Rick N3HIA, (301) 574–3998 eves.***

QUINCY, IL The Sixth annual Tri-States Swapfest (ARRL approved) will be sponsored by the Western Illinois ARC, and held at 3737 N. 5th St., 1 mile N of US 24 and N 5th, from 8 AM–3 PM. Advance tickets $2.50, $3 at the door. VE Exams. XYL activities. ARRL table. Talk-in on 147.63/.03 and 146.34/.94. Contact ***Jim Funk N9JF, c/o WIARC, PO Box 3132, Quincy IL 62301. (217) 336–4191***, or ***(217) 336–3321.***

ELGIN, IL The annual T.C.R.G. FEST, sponsored by the Tri-County Radio Group Inc., will be held at Elgin VFW Post #1307 from 8 AM–3 PM. Set-up from 7–8 AM. Advance tickets $4, $5 at the door. Registered tables $8, $10 at the door. Tailgate space $5. To register, send an SASE with check or MO to ***T.C.R.G., c/o Ken Whitmire N9KSP, 10210 Rt. 31, Algonquin IL 60102. (708) 658–3411.*** Ask for Ken. M-Sat. 10 AM–7 PM CST. Talk-in on 443.025 (114.8 PL); 147.225 + (107.2 PL)

CAMBRIDGE, MA The MIT Electronics Research Society, the MIT Radio Society and the Harvard Wireless Club will co-sponsor a Flea Market from 9 AM–2 PM at Albany and Main St. Admission is $1.50. Free off-street parking. Sellers $8 per space at the gate, $5 in advance (includes 1 admission). Set-up at 7 AM. Covered tailgate area. Contact ***(617) 253–3776.*** For advance reservations make checks payable to ***MIT Radio Society*** and mail with an SASE before Aug. 5th to ***W1GSL, PO Box 82 MIT BR., Cambridge MA 02139.*** Talk-in on 146.52 and 449.725/ 444.725–PL 2A–W1XM repeater.

AUG 22–24

BLACKSBURG, VA Personal Computer Interfacing–Practical Instrument Automation, Networking and Control Techniques. A 3-day hands-on workshop. Contact ***Dr. Roy Jones, (703) 231–5242***, or ***(703) 231–6478.***

AUG 23–25

SAGINAW, MI The 1991 ARRL National Convention will be held at the Saginaw Civic Center. Advance 3-day general admission tickets are $7, $9 at the door. For lodging reservations ($32–$69 per night) call ***1–800–444–9979***. Call ***(517) 792–6270*** for camping info. Make checks payable to ***1991 ARRL Convention Committee***. Mail to ***Camping Registration, PO Box 1783, Saginaw MI 48605-1783***. Reserve Flea Market tables ($15 each) by calling ***(517) 893–3475***. Make checks or money orders payable to ***1991 ARRL Convention Committee***. Mailing address: ***Convention Pre-Registration, PO Box 1783, Saginaw MI 48605-1783***. If registration with SASE is received before July 4th, the 3-day tickets will be mailed to the applicant. Tickets requests received July 5th–Aug. 16th will be held for pick up. Advance registration closes on Aug. 16th.

AUG 25

FORT WAYNE, IN The Summit City Hamfest, sponsored by the Fort Wayne RC, will be held at the 4-H Fairgrounds on Carroll Rd., from 8 AM–3 PM. Free parking. Tailgating $7. Flea Market. Set-up at 6 AM. Advance tickets $3, $5 at the door, kids under 12 free. Reserved table & chair in open air building is $10; in air conditioned building, $15. Contact ***Frank Jaworski, PO Box 15127, Fort Wayne IN 46815. (219) 485–2634.*** Talk-in on 146.16/.76, 449.875/444.875. All Flea Market reservations include one admission ticket to a maximum of three tickets.

ST. CHARLES, MO The St. Charles ARC will sponsor HAMFEST91 at Blanchette Park from 6:30 AM–3 PM. Forums and License Exams (10 AM). Free admission and parking. Handicapped parking available. Fee for Flea Market space. Talk-in on 146.67 and 444.65 repeaters and 146.52 simplex. Contact ***John Lehnhoff N0HMZ, 155 Brentwood, St. Charles MO 63303. Phone (314) 928–2510 after 5 PM.***

LEBANON, TN The Short Mountain Repeater Club will sponsor an outdoor Hamfest from 7 AM–3 PM at Cedars of Lebanon State Park, US Highway 231, seven miles south of I-40. Exhibitors bring your own tables. Space available on first come, first served basis. Free admission. Talk-in on 146.91. Contact ***Mary Alice Fanning KA4GSB, 4936 Danby Dr., Nashville TN 37211. (615) 832–3215.***

MARYSVILLE, OH The Union County ARC will sponsor the Marysville Hamfest/Computer Show at the fairgrounds in Marysville starting at 6 AM. Free overnight camping with free entertainment on Sat. eve. at 8 PM. Set-up on Sat. at noon. Admission $3. FCC Exams at all levels (walk-in only). The world famous HAMCAM VAN will be on display in the Merchants Building. No advance tickets. Vendor spaces are $5 for a 10' space. Contact ***Gene Kirby W8BJN, 13613 US 36, Marysville OH 43040*** or call ***(614) 261–8871 days; (513) 644–0468 eves.***

AUG 31–SEP 1

ALAMORORDO, NM The Alamogordo ARC will present their Seventh annual Hamfest on Labor Day weekend at the Otero County Fairgrounds from 8 AM–5 PM Sat.; 8 AM–2 PM Sun. RV parking for self-contained vehicles. Admission and parking are free. Tables and booths available on a first-come basis. Talk-in is on 146.80. VEC Exams will be held at 12 noon on Sat; 9 AM on Sun. Contact ***Larry Moore WA5UNO, 1830 Corte del Ranchero, Alamogordo NM 88310-4717. (505) 437–0145.***

SPECIAL EVENT STATIONS

AUG 1–4

GRAND HAVEN, MI In conjunction with the annual Coast Guard Festival, the North Ottawa ARC will operate SE Station KE8DL from 1600Z–0000Z. Frequencies: 7.225/.250, 14.250/.300, 28.400/450. For certificate, send QSL card or equivalent with an SASE to ***KE8DL, 1815 Hillcrest, Grand Haven MI 49417.***

AUG 2–4

ST. LOUIS, MO "Youth in Ham Radio" is the theme of special event stations operating from three locations from 0001Z Aug. 3rd (Friday eve., Aug. 2nd, local time) until 2359Z Aug. 4th. Sammy Garrett AA0CR (1991 Westlink Report Young Ham of the Year) will operate from St. Louis MO; Mary Alestra KB2IGG (1990 Westlink Report Young Ham of the Year) will operate from New York City; Darrel Craig KK6BB, will operate from Fullerton CA. For QSL from any station, send QSL and contact number with a legal size SASE to ***AA0CR, PO Box 5832, St. Louis MO 63134.*** For a certificate for contacting all three stations, send 3 QSLs and 3 contact numbers with a 9x12 SASE. Frequencies: General/Novice portions of 40, 20, 17, 15 and 10 M (phone/CW).

AUG 10–11

BARNEGAT LIGHT, NJ The Old Barney ARC will operate SE Station W2OB from 1200–2300UTC Sat. and Sun. to celebrate National Lighthouse Day. Frequencies: CW–7040, 14040, 21040, 28040; SSB–7275, 14290, 21390, 28390; 146.835 repeater; 146.52 simplex. QSL via ***Joe Fleishinger NU2F, 75 Joshua Dr., Manahawkin NJ 08050.***

AUG 14–16

BRIDGEWATER, NJ The Somerset County Office of Emergency Management will operate WC2ADK 1400–0100Z each day to promote Amateur Radio. R.A.C.E.S. and Public Service at the annual 4-H Fair. HF on lower 25 kHz of General 80-10 meters, packet, ATV; visitors on 145.32 simplex. Send QSL and SASE to ***Somerset County OEM/4H, PO Box 3000, Somerville NJ 08876.***

AUG 15–18

YORKTOWN, VA The Southern Peninsula AR Klub will operate N4KZR between 1400Z and 2200Z on Aug. 16, 17 and 18, to commemorate the 300th anniversary of the Founding of Yorktown VA, where the last battle of the American Revolution was fought. Phone operation is planned for the General portions of 80, 40, 20 and 15 meters, as well as the Novice 10 meter phone subband. For a commemorative certificate, QSL with SASE to ***M.C. Ellis, 300 Artillery Rd., Yorktown VA 23692.***

AUG 17–18

VANCOUVER, WA The Clark County ARC of Vancouver/Clark County WA, will sponsor station W7AIA to help celebrate the 32nd annual Antique Aircraft Fly-in and Display at Evergreen Flying Field (just East of Vancouver). Operating times will be from 1800–2359 UTC Sat.; 1800–2300 UTC Sun. Frequencies: Lower portion of General class part of the 40, 20, 15 meter bands and on or near 28.455 in the Novice/Tech portion of 10 meters (conditions permitting). For a commemorative certificate showing a 1917 Jenny, SASE only to ***CCARC, W7AIA, PO Box 1424, Vancouver WA 98668.***

MANITOWOC, WI The Mancorad RC of Manitowoc will operate W9DK from 1400–0000Z both days, from the WW II Submarine "Cobia" to celebrate Maritime Week. Frequencies: 7.250, 14.250, 21.350, 28.450. For certificate, send QSL and an SASE to ***Mancorad RC, PO Box 204, Manitowoc WI 54221-0204.***

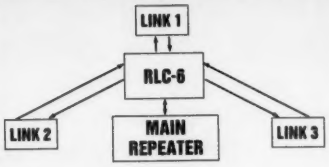
AUG 28

TRANSITION NIGHT QSO PARTY for 135 CM The Eastern VHF/UHF Society urges amateurs to join together on the 135 CM band on the eve of Tues. Aug. 27th, to honor our 135 CM past and open our new band and opportunities. This event is to be known as "The 220 QSY QSO Party." Phase A extends from 2200–2400 GMT Aug. 27th (the last few hours before the change). The entire band, 220 to 225 MHz can be used. Phase B, from 0000–0400 GMT on Aug. 28th, is the first 4 hours after the change. Use of the entire band is allowed. For complete instructions and rules, contact ***Eastern VHF/UHF Society, Thomas J. Kirby W1EJ, 1 Meadow Knoll, PO Box 455, Pelham NH 03076.***

AUG 28–SEP 2

MOUNT PLEASANT, IA The Mt. Pleasant ARC will operate W0MME during the 42nd annual Midwest Old Threshers Reunion. Operation will be in the General portion of the 80–10 meter phone bands. Club members will monitor their 444.95 and 147.39 repeaters for those attending. For a QSL send an SASE to ***Dave Schneider WD0ENR, 507 Vine, Mt. Pleasant IA 52641-2846.***

REPEATER LINK CONTROLLER



LINK COMM RLC-6

- ALLOWS 3 HUB OR CHAIN LINKS
- CAN BE INTERFACED TO MOST REPEATER CONTROLLERS
- DIRECT CONNECTION TO S-COMM 5/6 REPEATER CONTROLLERS
- HALF OR FULL DUPLEX LINK
- REQUIRES ONLY 3 LOGIC LINES FOR CONTROL

ONLY $149.95

LED DISPLAY BOARD $29.95
S-COM CABLE $9.95

LINK COMM
PO BOX 1071 • BOZEMAN, MT 59771
(406) 587-4085

CIRCLE 47 ON READER SERVICE CARD

Field Day All-Band Antenna

Ready to Use		Full Legal Power
Fastest Install	Tough	No Lossy Traps
Coax Feed	Flexible	Low Noise
3000 V Insul	Kink-Proof	Never Corrodes

QRV-80-10 51 ft. long **$49.95**
Includes 40-page Tech Manual
Infopack $1

QRV-160-10 102 ft. long **$59.95**
Add $5 Post & Handling

AntennasWest
Box 50062-S, Provo, UT 84605 (801) 373-8425

CIRCLE 296 ON READER SERVICE CARD

Quality Microwave TV Antennas

WIRELESS CABLE - IFTS - MMDS - Amateur TV
Ultra High Gain 50db(+) • Tunable 1.9 to 2.7 Ghz.
• 36-Channel System Complete $149.95
• 12-Channel System Complete $114.95
• Call or write (SASE) for "FREE" Catalog

PHILLIPS-TECH ELECTRONICS
P.O. Box 8533 • Scottsdale, AZ 85252
(602) 947-7700 ($3.00 Credit all phone orders)
MasterCard • Visa • COD's • Quantity Pricing

LIFETIME WARRANTY

CIRCLE 249 ON READER SERVICE CARD

Carole Perry's

Amateur Radio License Courses
NOVICE...Theory, Regulations & Code
Reg. $49.95...NOW $39.95 *
NO-CODE TECHNICIAN...Theory & Regulations
Reg. $59.95...NOW $49.95 *
* Includes Postage and Handling

Computer Program for IBM®
(Including XT, AT, PS/2, and IBM® clones)
Developed for Media Mentors by Diamond Systems, Inc.

LATEST INFO PER THE FCC!

Media Mentors INC.

To order, call: (718) 983 - 1416
P.O. Box 131646, Staten Island, NY 10313-0006

CIRCLE 241 ON READER SERVICE CARD

MAKE CIRCUIT BOARDS THE NEW, EASY WAY

WITH TEC-200 FILM

JUST 3 EASY STEPS:

- Copy circuit pattern on TEC-200 film using any plain paper copier
- Iron film on to copper clad board
- Peel off film and etch

convenient 8½ × 11 size
With Complete Instructions
SATISFACTION GUARANTEED
5 Sheets for $3.95 10 Sheets only $5.95
add $1.50 postage *NY Res. add sales tax*

The MEADOWLAKE Corp.
Dept. P, P.O. Box 497
Northport, New York 11768

CIRCLE 55 ON READER SERVICE CARD

QUICK, EASY, & COMPACT

Flash cards *NOVICE thru EXTRA* theory Key words underlined. Over 1600 sets in use! For beginner, OMs, XYLs & kids.

NOVICE	$11.95
TECHNICIAN	$10.95
GENERAL	$ 9.95
ADVANCED	$15.95
EXTRA	$14.45
Shipping 1—$ 3.00	
2 or more —$ 4.00	
CLUB DISCOUNTS	

Order Today! from

VIS STUDY CARDS
P.O. BOX 16646
HATTIESBURG, MS 39404

CIRCLE 104 ON READER SERVICE CARD

ICOM BATTERY INSERTS

BP-2	7.2v	500mah	$14.00
BP-3	8.4v	270mah	$15.00
BP-5	10.8v	500mah	$21.00
BP-7	13.2v	500mah	$23.00
BP-8	8.4v	800mah	$21.00
BP-22	8.4v	270mah	$22.00

KENWOOD BATTERY INSERTS

PB-21	7.2v	200mah	$12.00
PB-21H	7.2v	600mah	$15.00
PB24 Tabs	9.6v	600mah	$15.00
PB-25/26	8.4v	500mah	$18.00

YAESU BATTERY INSERTS

FNB-3/3A	10.8v	500mah	$28.00
FNB-4/4A	12v	500mah	$27.50
FNB-10	7.2v	600mah	$15.00
FNB-11	12v	600mah	$30.00
FNB-12	12v	500mah	$30.00
FNB-17	7.2v	600mah	$18.00

MORE BATTERY INSERTS

Tempo S1 Early	270 mah	$19.95
Tempo S2/4/5 Late	500mah	$21.00
Standard BP-1	270 mah	$19.95
Ten-Tec BP1	500mah	$19.95
San-Tec #142#144 Tabs	600mah	$22.00
Azden 300 Tabs	600mah	$15.00
Bearcat	600mah	$20.00
Regency MT1000 Tabs	600mah	$15.00

ICOM PACKS 2/4SAT & 24AT

BP-83S	7.2v	750mah	$38.00
BP-84	7.2v	1000mah	$50.00
BP-85s	12v	800mah	$60.00

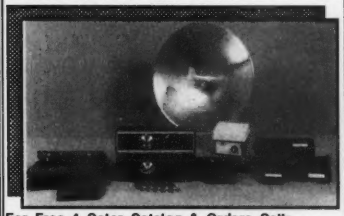
* Add $3.00 Shipping FREE Catalogue

TNR The Battery Store
279 Douglas Ave., Suite 1112
Altamonte Springs, FL 32714
VISA 1-800-346-0601

CIRCLE 62 ON READER SERVICE CARD

CABLE T.V. EQUIPMENT

Converters, Remotes,Descramblers and more!



For Free 4 Color Catalog & Orders Call:

1-800-835-2330

Free Tech Support Booklet

VISA Tel: (402)331-3228 Fax:(402)592-4745 MC

Full Warranty

"Your Best Buys and Warranties Start With A Free 4 Color Catalogue From Cable Network™."

Cable Network™ Will Beat or Match Anyone's Prices, on Comparable Product.

Cable Network™
11111 M St. Ste."73" Omaha, Ne. 68137

For Our Records
BY ORDERING CABLE T.V. EQUIPMENT FROM CABLE NETWORK™ THE PURCHASER AGREES TO COMPLY WITH ALL STATE AND FEDERAL LAWS REGARDING PRIVATE OWNERSHIP OF CABLE TV EQUIPMENT , IF YOU ARE UNSURE OF THESE LAWS CHECK WITH YOUR LOCAL OFFICIALS.

Date:_____

Signed:_____

CIRCLE 277 ON READER SERVICE CARD

Townsend Electronics

RIG SAVER

- Allows you to safely mount your hand-held or mobile radio where you can see the controls.
- Vinyl coated adapter plate protects your radio.
- SlimLine **$24.95.** Heavy Duty **$29.95** + $3.00 S & H.
- Adaptable to nearly any vehicle or station use.
- Mounts on ANY single flat surface.

1-800-338-1665

P.O. Box 415
Pierceton, IN 46562

CIRCLE 299 ON READER SERVICE CARD

Ampire

Mastmounted RF or Coax switched GaAsFET Low Noise Preamplifiers.

HELICAL FILTERED PREAMPS FOR OUT-OF-BAND INTERMOD

Model 146 covers the entire 2 meter band
• RF switched 20dB Gain • 75dB Noise Figure
• Handles 160 Watts

Model 146OS has a 3dB bandpass of 1.3MHz

Model 160 covers 149–174MHz • 10MHz bandpass

Model 440 covers 420–450MHz • 10MHz bandpass • 17dB gain • .75dB Noise Figure • Handles 100 Watts transmitted power

All models also come in the CP version • coax powered 12VDC

All models are factory tuned per customer request. All non-coax powered models are powered with external 13–20VDC and are voltage regulated for stability

Models 146's and 160 $179
Model 440's $199

Shipping for 1 devise—$5.50
Each additional devise—$3.50

MMIC's—Monolithic Microwave Amplifier components

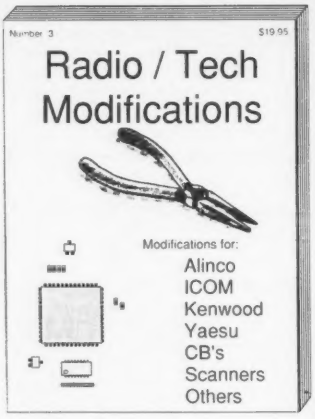
WIDE BAND • 1MHz–2GHz • Build your own RF amplifiers EASY!!!

Call or write for construction info

Low Noise GaAsFET microwave transistors
Low prices!!!
shipping & handling

Ampire Inc.
10240 Nathan Lane • Maple Grove, MN 55369
(612) 425–7709

3rd Edition
Over 150 Modifications



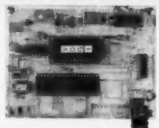
- Extented Frequency Coverage.
- Cross Band Repeater Mods.
- Detailed Drawings Included.
- Sold in Radio stores Everywhere.

$19.95
Add $3 Shipping
Visa MC Amex

art sci
P.O. Box 1848
Burbank, CA 91507
(818) 843-4080

CIRCLE 276 ON READER SERVICE CARD

VIDEO I.D. BOARD



- Custom Graphics with your Call Sign
- 4 Screens (2 Hi-res/2 color bar)
- 12 VDC Operation
- Instant Video ID
- Video Relay for switching in Live Camera Video
- Built-in Automatic Sequencer-Timer (steps through all four screens)

VDG-1 with pre-programmed calls:
$99

Call or write for catalog of available graphics

ELKTRONICS
12536 T.R. 77 • Findlay, OH 45840
(419) 422-8206

CIRCLE 8 ON READER SERVICE CARD

Amateur Software and Hardware for the Commodore User

ART-1: A complete interface system for send and receive on CW, RTTY (Baudot & ASCII) and AMTOR, for use with the Commodore 64/128 computer. Operating program on disk included.
$199.00

AIR-1: A complete interface system for send and receive on CW, RTTY (Baudot & ASCII) and AMTOR, for use with Commodore VIC-20. Operating program in ROM.
$99.95

SWL: A receive only cartridge for CW, RTTY (Baudot & ASCII) for use with Commodore 64/128. Operating program in ROM.
$69.95

AIRDISK: An AIR-1 type operating program for use with your interface hardware. Both VIC-20 and C64/128 programs on one disk. **$39.95**

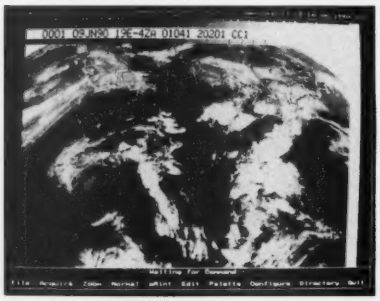
AIR-ROM: Cartridge version of AIRDISK for C64/128 only.
$59.95

MORSE COACH: A complete teaching and testing program for learning the Morse code in a cartridge.
For C64 or C128. **$49.95**
VEC SPECIAL **$39.95**

G AND G ELECTRONICS
OF MARYLAND

8524 DAKOTA DRIVE, GAITHERSBURG, MD 20877
(301) 258-7373

CIRCLE 169 ON READER SERVICE CARD



Receive Weather Satellite Images and Charts on your PC with Quorum's Totally Integrated and Affordable Weather Facsimile System

Quorum introduces the first totally integrated system for the reception of weather satellite images directly on your personal computer. Selection of HF NAFAX, GOES WEFAX, GOESTAP, METEOSAT, NOAA and METEOR APT (including satellite downlink frequency selection) are made under complete program control from your PC keyboard.

The easy to learn and use Menu driven program allows you to capture, store, retrieve, view and print images with a few simple keystrokes. Images can be colorized from a palette of up to 262,000 colors when using a VGA display.

System configurations capable of NAFAX reception start at $399.00 while fully capable systems can be configured for $1500 to $2000, providing professional quality at low prices.

For complete information and a Demo Disk, call or write:

Quorum Communications, Inc., 1020 S. Main St. Suite A, Grapevine, TX 76051 (817) 488-4861. Or, download a demo from our Bulletin Board by calling (817) 421-0228 using 2400 baud, 8 data bits and No parity.

QUORUM COMMUNICATIONS

CIRCLE 24 ON READER SERVICE CARD

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Packet or RTTY— Which is Better?

Packet, packet, packet . . . who's got the packet? As one of the newer forms of digital communication, packet circuits have certainly taken amateur circles by storm. Look around this magazine if you doubt this fact. Nevertheless, packet just might not be for everyone. To wit, consider this letter from Howard Evans W6IDS.

Howard writes, "I run a landline bulletin board named 'Amateur Radio CBCS' in Rancho Cordova, California. . . . What interests me is the number of users who have mentioned in the message areas (both local and national) that there seems to be a bit of disappointment regarding packet. It seems that the common line focuses on the apparent 'overload' of the packet systems in general.

"In the messages, I read comments about a pronounced delay in the forwarding/receipt of packet mail, and a marked comparison of RTTY to packet in through-put efficiency, with RTTY standing out.

"I have tested packet a couple of times and I must say I still prefer RTTY for general communications. I know the technology is in vogue, and it is chic to be a packeteer, but the amount of cost required to set up a reasonable packet station versus using a normal RTTY station, to me is not really justified. Of course, this is my own opinion, and frequently I am at odds with the vast majority on issues. I just can't get excited about packet, even if it is the in-thing to do today.

"For that reason, I am very disappointed at what appears to be a decline in active RTTY stations. Oh, I know they're there, but it *used* to be easy to find the critters lurking about, either monitoring for a call, or already engaged in a contact. I have spent some time tuning around, and it does seem to me that the general RTTY activity is declining. I think that is our loss.

"It is my contention that for HF communications, RTTY is the better way to go, overall. And yet, more people continue to focus on packet, only to reflect later on how 'slow' it is, and how entangled it has become in territorialism, intra-system bickering, and politics.

"I'm not trying to convince you of a particular point of view, rather I am trying to convey a sense of concern over what I perceive as an insufficient arrangement of priorities which has placed packet over RTTY."

AMTOR Hardware

Strong sentiments, Howard. I wonder how many others agree. Over the decade and a half this column has been running, I have seen many trends come and go. Will packet be just another fad, or does it have a true place in the scheme of things? I certainly look forward to other readers' thoughts and comments on this apparent schism in the digital world.

If packet has its critics, how about other non-Baudot forms of digital communication? Garry Hawkinson WA0RXB of Proctor, Minnesota, asks whether AMTOR is a software operation using a regular terminal unit, or if other hardware is required as well.

I guess the answer is yes . . . and no. One way to get onto AMTOR is with one of the newer multimode terminal units. These little wonders take care of all the work of encoding and decoding the various AMTOR modes, requiring only a dumb terminal on your end. We have mentioned AEA and Kantronics units in this column in the past, but other schemes are possible, including those that move all the smarts for the protocol into your computer, and rely only on the switching circuits of a terminal unit to complete the connection.

However, whatever technique you choose to get onto AMTOR, your transmitter and receiver have to be able to switch from transmit to receive and back again very quickly and cleanly. When using a mode which requests block-by-block confirmation, such as AMTOR or packet, efficient transmit/receive switching is a must.

One such problem was addressed in the July 1990 "RTTY Loop," in which a modification for the ICOM IC-740 transceiver was published. The transmit/receive timing was altered, allowing for more efficient and accurate AMTOR transmissions.

Hope this helps you sort out the alphabet soup of RTTY modes. We have covered AMTOR in depth in the past, and will continue to look into it in the future.

AMTOR and RTTY Bands

Once you get on AMTOR, though, the question of where to find QSOs comes up. This puzzles William Martin N7EU, who writes that he has "...been operating RTTY and AMTOR for about five years now, and wonders about the operating habits on this mode. Why is it most of the fellows seem to congregate on either 80 or 20 meters when there is so much other spectrum to try? It would seem to me that 40, and especially 30, meters would be an ideal band to use during the daytime period of operation. Since I don't have an 80 meter antenna yet, that leaves me only 20 meters to slug it out trying to make a contact on these two modes. On 20 it seems the boys really get crammed into a small portion of the band, making it difficult to make a contact. Thirty meters seems to be quiet most of the time, with a notable lack of activity on RTTY and AMTOR. Is it some unknown tradition that keeps the hams on RTTY in a certain band, or are they not interested in trying something new? Even on 10 meters, where you would expect some Novice to try RTTY, activity is nil.

"Maybe in one of your upcoming articles you could respond to my question and encourage some of the fellows to try 40 and 30 meters. After all, 30 is a CW/RTTY exclusive band, and seems well suited for this purpose. Is there a "calling" frequency on 30 that I am unaware of, or is everyone out to lunch on this one?

"I really enjoy the two modes, and find AMTOR to have a bit of an edge over RTTY at my power level (100 watts) and modest dipole antenna. I use the CP-1 with the MBA-TOR inserted into the back of the C-64, and find it quite adequate for my level of operating with these modes. I bought these items used, and they are quite adequate for the beginner.

The only disadvantage I can see is that this setup does not support packet. But I suspect that could be overlooked, considering the bargain price. You could always pick up a separate unit for packet later."

Well, William, I would say that the answer to your question about band use can be stated in one word: INERTIA! Hams congregate around these frequencies because that's where they started; they have always been there. Why those frequencies were chosen has to do with conditions no longer applicable, like crystal availability and VFO stability. That they were chosen remains quite applicable, because if you are looking for a QSO, you can tune where you know others are listening. And so the pile-up grows! There is nothing inherently wrong with staking out a new frequency, as long as it is in a valid RTTY band and you are not stomping on some net.

This is a good question, with valid arguments on both sides, and I look forward to hearing some other readers' comments on the topic.

As far as the hardware you are using, it is good to see that a shoestring system (by cost) does not have to be too limited. Great tips on the C-64 and accessories.

Check out those garage sales and flea markets, folks. After all, one man's trash may be another's terminal.

Drop me a note when you are on your terminal, or at your quill and pad. Either by mail, as these folks did, or on one of the online services: CompuServe (ppn 75036,2501) or Delphi (user name MARCWA3AJR). 73

NEW From Micro Computer Concepts
RC-1000 REPEATER CONTROLLER
• Autopatch
• User Programmable CW ID, Control & User Codes & Timeouts
• Intelligent CW ID • Auxiliary Outputs • Easy to Interface • Remote Base/Tape • Reverse Patch • Tailbeeps • 12 VCD Operation • DTMF Decoder with Muting • Telemetry • Control RX • Response Tones • Programmable COS Polarities • Detailed Application Manual with schematics • 90-Day Warranty
Wired & Tested w/manual $239.95
RC-100 Repeater Control NEW
• Intelligent CW ID
• Remote Base/Tape w/Freq. Programming of Kenwood, ICOM, Yaesu HF Rigs
• Tailbeeps • DTMF Decoder with Muting
• Auxiliary Outputs
• Detailed Application Manual with schematics (25 pages)
W & T $139.95
VISA MasterCard
Micro Computer Concepts
7869 Rustic Wood Drive
Dayton, OH 45424
513-233-9675
VS-1000
ATV Repeater control & video switcher
.... $399.95
NEW ADDED FEATURES
CIRCLE 160 ON READER SERVICE CARD

AUTHORIZED COMMODORE SERVICE CENTER
FLAT RATES
C64 $40 C128 $55
C128D $65 1541 & 1571 DRIVES $50
Power Supply, Heads & Motors not included.
INGENIOUS Software Inc.
2120 West Main; Suite #7
Rapid City, SD 57702
(605) 348-8333
AMIGA, PCs, Peripherals
A500, 1000, 2000, A3000 & Comm. PCs $60, Comm. Printers & Monitors $45. Figure $15–$45 Parts.
We pay cash for used Commodore equipment (regardless of condition).
CIRCLE 33 ON READER SERVICE CARD

Number 22 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier

DRAKE

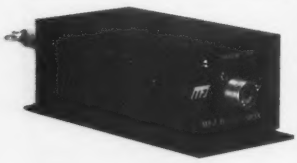
R. L. Drake's new R8 worldband shortwave receiver lets you hear world events as they happen. The R8 can be programmed to store up to 100 stations in memory for instant recall. A full complement of state-of-the-art filters and computer interface capability are also built in. It operates in the AM, LSB, USB, CW, RTTY and narrowband FM modes. The frequency range is 100 kHz–30 MHz, and covers all worldband frequencies as well as most amateur bands. With an optional module, the R8 can also cover fire, police, public service broadcasts, and additional amateur bands in VHF (35–55 MHz, 108–174 MHz).

The suggested retail price for the R8 is $979. For more information, contact *R. L. Drake Company, P.O. Box 112, Miamisburg OH 45342; (513) 866–2421.* Or circle Reader Service No. 201.

RADIO SHACK

Radio Shack is now offering the Micronta® Ham Radio SWR/Power Meter (cat. no. 19-320). This compact meter is ideal for optimizing antenna settings for hand-held transceivers as well as mobile or fixed ham radios. It is specifically designed for use on two popular amateur radio bands: 2m (144 MHz) and 70cm (440 MHz). The SWR/Power Meter's main features include: low insertion loss, enabling it to remain connected at all times; wide-range accuracy that lets the user measure power up to 60 watts; and a sealed die-cast aluminum enclosure for durability.

The meter retails for $39.95 and is available at Radio Shack stores and participating dealers nationwide. For more information, contact *Radio Shack, 700 One Tandy Center, Fort Worth TX 76102; (817) 390–3300.* Or circle Reader Service No. 202.



MFJ

MFJ has released two new products: a balun box and a world map clock. Mount the **MFJ-912 W9INN Balun Box** outside the building and connect it with coax from your wide-range T-network tuner. The MFJ-912 will convert the unbalanced coax to the balanced ladder-line transmission line, functioning like an internal balun even though it's located away from the tuner. It retains the flexibility and efficiency of the ladder line without bringing the line into the shack.

The **MFJ-110 DXers' World Map Clock** shows the time and date at any QTH in the world, and also lets you see the location of your contact. Easy-to-use push-buttons let you instantly move the display to a QTH in every time zone. The "recall" feature instantly moves the display back to local time. The clock shows the day of the week, month, date and year, and has an alarm.

The MFJ-912 W9INN Balun Box is $39.95; the MFJ-110 World Map Clock is $24.95. Both come with a one-year unconditional guarantee. Contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762; (601) 323–5869, (800) 647–1800, FAX (601) 323–6551, Telex 53 4590 MFJSTKV.* Or circle Reader Service No. 203.

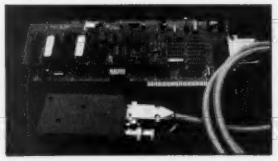
ICOM

ICOM has announced the new IC-2410A/H 144 and 440 MHz dual-band transceiver, which includes features such as simultaneous receive on the same band, microphone controllability and optional remote control. The IC-2410A/H is one of the smallest in its class: 5.5″ (W) x 1.6″ (H) x 6.9″ (D), and weighing just three pounds. In addition to receiving two bands simultaneously, it will receive two frequencies on the same band.

The IC-2410A/H comes in two versions. The IC-2410A puts out a maximum of 25 watts on both UHF and VHF; maximum output power for the IC-2410H is 45 watts on VHF and 35 watts on UHF. Both versions offer high, medium and low power settings. A variety of operations can be controlled with the HM-56 DTMF hand microphone and optional UT-55 DTMF encoder/decoder.

For prices and more information, contact *ICOM America, 2380 116th Ave. N.E., P.O. Box C-90029, Bellevue WA 98009-9029; (206) 454–8155.* Or circle Reader Service number 209.

GRACILIS, INC.



Gracilis, Inc. has introduced the PackeTwin™ data system, a dual-channel PC interface card, integrated radio modem, and radio transceiver, with TCP/IP and AX.25 software for PC/XT/AT systems. Both PackeTwin channels can operate at conventional speeds of 1200–9600 baud. Additionally, one channel is capable of 1 Mb/sec operation with existing 56K radio modems as well as future higher speed developments. Both channels support RS-232, RS-422, and TTL. Radio modems are available for 1200, 2400 and 9600 bps. KA9Q's TCP/IP system software is also available with the system for packet network applications.

PackeTwin prices range from $199 to $599, depending on the configuration. For more information, contact *Gracilis, Inc., 623 Palace Street, Aurora IL 60506; (708) 897–9346* Or circle Reader Service No. 205.

RAI ENTERPRISES

RAI Enterprises has released a new PC software program, "Autolog Plus II." This program is a unique blend of a highly sophisticated station log and a fully programmable CW autokeyer. The log features four programmable on-screen time zone clocks, a 200-year calendar, a personal database and a notepad database to keep track of all personal data. Other features include a DXCC database, beam headings, QSL tracking, custom screen colors, on-screen "quick notes"to keep track of frequencies and calls in a pile-up, a programmable tracking cell with sort and print functions, and the ability to search and modify all log files. The only hardware requirements are a printer driver and 360K of free memory. An RS-232 interface is provided to drive the positive voltage CW key input of a solid-state receiver.

"Autolog Plus II," including the interface, sells for $45 and is available on both 5.25″ and 3.5″ floppies. For more information, contact *RAI Enterprises, 4508 N. 48th Drive, Phoenix AZ 85031.* Or circle Reader Service No. 204.

ALEXANDER BATTERIES

Alexander Batteries is offering several new made-in-the-USA batteries for Standard HX500 portable radios. The H26204 is a 7.5V/500 mAh nickel-cadmium battery. The H26205 is also rated at 7.5 VDC, but features longer run times and a 900 mAh capacity. The H26206 is 10 VDC, with a 425 mAh capacity; the H26207 is 10 VDC/700 mAh. Alexander's also has replacement batteries for the ICOM BP-83 and BP-84, and for Kenwood's TH-205A, TH-205AT, TH-215A, TH-215E, TH-315A, TH-415A and TH-415E radios.

For prices and more information, contact *Alexander Batteries, P.O. Box 1508, Mason City IA 50401; (515) 423–8955, FAX (515) 423–1644.* Or circle Reader Service No. 207.

HI-RES COMMUNICATIONS

Hi-Res Communications has released the KWM2 video, packed full of detailed information regarding almost every facet of the KWM2 and spotlighting world-renowned Collins Radio expert Dennis Brothers. The video begins with basic tools and equipment, then Dennis takes you through tune-up and operation, troubleshooting and repair, modification identification and installation, and complete alignment.

For the price and more information, contact *Hi-Res Communications, Inc., Floyd Soo KF8AT, 18464 Ash Creek Drive, Mt. Clemens MI 48044-1240; (313) 228–1600.* Or circle Reader Service No. 206.

OPTOELECTRONICS

Optoelectronics is offering a new, free (to people involved with radio broadcasting and reception from sub-audio to 3 GHz) 16-page brochure describing the firm's newest hand-held and bench-top instruments. The brochure includes descriptions, technical data and useful tips on how to use frequency-finding handi-counters, universal counter-timers for lab and field, PC-based counters with Windows 3.0 for control and display, active preselector bandpass filters, antennas and accessories.

Contact *Optoelectronics Inc., 5821 NE 14th Avenue, Fort Lauderdale FL 33334; (800) 327–5912, (305) 771–2050.*

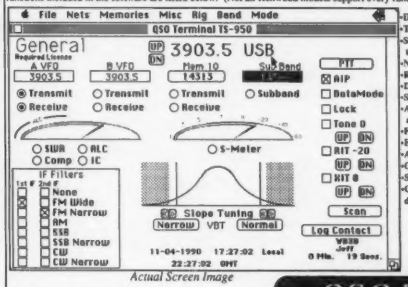
GIEHL ELECTRONICS

Giehl Electronics is offering two software enhancement kits, one for the Kenwood TS-940 and one for the Ten-Tec Paragon. The TS-940 kit features tunable memories that allow you to change the frequency of a memory channel using the main tuning knob, memory bank selection using the "UP" and "DOWN" keys, and easily-set kHz per revolution. The Paragon kit offers band registers that store the last-used frequency, mode, and filter for all bands 160 through 10 meters; a 10-minute timer that reminds you to ID your station, a single key band selector that makes QSYing fast, and many other enhancements. Both kits include a new software chip, complete documentation, and installation instructions.

The kits cost $72 each, plus $3 S & H. For more information, contact *Giehl Electronics, P.O. Box 18335, Cincinnati OH 45218.* Or circle Reader Service number 208.

QSO Comp-Troller
PC Control for Kenwood Rigs
New!

QSO Software proudly announces a second entry in quality ham radio software. QSO Comp-Troller offers complete PC control of Kenwood transceivers. The program is available for the Macintosh and MS-DOS (IBM Compatible) PCs with >64K EGA or VGA Graphics and a Microsoft® compatible mouse. QSO Comp-Troller is currently optimized for the Kenwood TS-950 transceiver, and will control all other RS-232 compatible Kenwood radios. Major functions included in the software are listed below. (Not all Kenwood models support every function)



Actual Screen Image

- Direct Keyboard Frequency Entry
- Text notes on each Memory
- Store and retrieve Memories to Disk
- Net Frequencies, notes, modes
- Required license & band limits
- Direct terminal emulation to Xcvr
- Sub Band receiver control
- Analog Multi-function and S-Meter
- Filter control
- Enhanced Scanning
- Automatic Logging
- GMT and Local on screen clock
- Slope and VBT tuning
- Graphical user interface with pull down menus and windowing

$99.95*

QSO Tutor
Study Aid for Amateur Exams

- Runs on IBM Personal Computers and compatibles or Macintoshes.
- Programs are available for all Amateur classes, Commercial Radio Telephone and Radar Endorsement. Sold separately.
- Work with the entire question pools (updated Nov. 1990), or study questions automatically selected by the program from your weakest areas.
- Includes full screen graphics & explanations on appropriate questions.
- Logs multiple study sessions and allows resuming at a later time.
- Creates randomly generated sample tests on-line or written on Epson/IBM or Macintosh graphics printers.

$29.95* per class Mac® IBM®

* PA residents add 6%. Commercial class is $39.95. Price includes shipping. Add $2 each for 3 1/2" IBM Disks

Public Domain disk also available. Contains excellent morse code tutor as well as other Ham Radio programs. Cost is $5 to cover materials and handling.

Call or write to order:
QSO Software
208 Partridge Way
Kennett Square, PA 19348
215-347-2109 (Voice or FAX)

QSO Software
Specialist in Software for the Micro by WB3IIF

CIRCLE 145 ON READER SERVICE CARD

NOW YOU CAN AFFORD THE BEST!

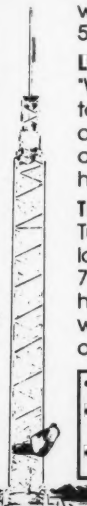
Engineered for the Ham, The Finest in Crank-Up, Free-Standing or Guyed Towers from Tri-Ex. For over 30 years, the INDUSTRY standard-backed up with Defense and Aerospace technology.

MW SERIES
Self-supporting when attached at first section—will hold normal Tri-Band beam; 25', 33', 50', and 65' heights.

W SERIES
Aerodynamic tower designed to hold 9 square feet in a 50 MPH wind. 3 models at 36', 51', and 67' heights.

LM SERIES
"W" brace motorized tower. Holds large antenna loads. Models at 37', 54', and 70' heights.

TM SERIES
Tubular construction for larger antenna loads at 70', 90', and 100' heights. Free standing, with motorized operation.



•TO ORDER CALL 1-800-328-2393
•TECH SUPPORT: (209) 651-2171 EXT. #73
•FAX NUMBER: (209) 651-5157

VISA MasterCard

Tri-Ex TOWER CORPORATION
Visalia, California

CIRCLE 22 ON READER SERVICE CARD

T.V.I. problems?

Low pass T.V.I. filters from Barker & Williamson

FL10/1500 FL6/1500 FL10/100 FL6/100

Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
FL10/1500	1000	34 MHz	52 MHz	70 dB	1.8–30 MHz	$41.50*
FL10/100	100	44 MHz	57 MHz	60 dB	1.8–30 MHz	$32.75*
FL6/1500	1000	55 MHz	63 MHz	70 dB	6 meter	$55.00*
FL6/100	100	55 MHz	63 MHz	50 dB	6 meter	$38.50*

All above to match 50 ohm transmitters and antennas.

*Add $2 shipping and handling

ALL OUR PRODUCTS MADE IN USA

BW BARKER & WILLIAMSON
Quality Communication Products Since 1932
At your Distributors. Write or Call
10 Canal Street, Bristol PA 19007
(215) 788-5581

CIRCLE 53 ON READER SERVICE CARD

73 Amateur Radio Today • ICOM

READER SERVICE GIVE AWAY

Just fill out the Reader Service card and send it in. You'll receive free product information from our advertisers, and one lucky reader will win a great prize from ICOM.

THIS MONTH'S READER SERVICE PRIZE

ICOM IC-24AT Dual Bander

The dual bander of the future is here! ICOM's IC-24AT mini-handheld gives you full operation on the 2-meter and 440 MHz bands, while offering outstanding flexibility and performance.

- 40 memories
- 5 watts
- Programmable scanning
- Priority watch
- Battery saver
- DTMF pad

. . . and more!

ADVERTISERS

R.S.#		page
109	A & A Engineering	63
164	Ace Communications of Indianapolis	18,19
83	Ace Systems	85
•	Advanced Electronic Applications	13*
253	Alabama Amateur Electronics	78
67	Alinco Electronics	15*
194	All Electronics Corporation	44
•	Amateur Electronics Supply	11*
•	Ampire, Inc.	68
18	Ant-Ventures	78
107	Antennas West	17
5	Antennas West	42
135	Antennas West	55
90	Antennas West	59
89	Antennas West	64
296	Antennas West	67
236	Antennas West	85
•	Antique Radio Classified	63
276	Artsci Publication	68
•	Associated Radio	75
16	Astron Corporation	61
243	AXM, Inc.	78
21	B & B, Inc.	17
53	Barker & Williamson	71
41	Barry Electronics Corporation	23
42	Bilal Company	55
197	Brainstorm Engineering	78
84	Broadcast Technical Service	78
168	Buckmaster Publishing	48*
7	Buckmaster Publishing	55*
170	Buckmaster Publishing	85*
56	Buckmaster Publishing	17*
•	Burghardt Amateur Radio	49
•	Butternut Electronics	51
184	C & S Sales, Inc.	25
116	C.A.T.S.	55
277	Cable Network	67
•	Cable X-perts	55
•	CB City International	17
•	Cellular Security Group	78
265	Chipswitch	78
156	Commpute Corporation	81
99	Communication Concepts, I	47
10	Communication Specialist	35*
121	Communications Electronic	21
15	Comtelco	47
12	Connect Systems	1
146	Creative Control Products	59
•	D&L Fabrication	59
256	Delta Research	81
257	Delta Research	78
13	Doppler Systems	78
19	Doug Hall Electronics	55
•	Down East Microwave	59
114	E. H. Yost	59
294	Eavesdropping Detection	85
185	Electronic Engineering	85
8	Elktronics	68
173	**Emcom Industries**	**58**
•	Engineering Consulting	57
75	Fair Radio Sales	47
300	**Foster Graphics**	**25**
169	G & G Electronics	68
80	Gardei Electronics	47
193	GGTE	43*
282	Giehl Electronics	55
17	GLB Electronics	65
72	Glen Martin Engineering	75
192	Grapevine Group	59
•	Ham Radio Classifieds	75
•	Ham Radio Toy Store	25
260	Ham-Soft	64
57	Hamtronics, Inc.	39
179	Icom America	COV2*
3	**Ingenious Software**	**69**
293	Innotek, Inc.	85
77	Interflex Systems	59
42	Isotron	55
270	J-Com	75
•	Japan Radio	37
•	K-Comm	85
•	**Kantronics, Inc.**	**17**
•	Kenwood USA Corporation	5,6,COV4
234	Lentini Communications	47
76	**Linear Logic**	**59**
47	Link-Com	67
101	Maxcom, Inc.	81*
55	Meadowlake Corporation	67
241	Media Mentors	67*
44	Metro Printing	63
86	MFJ Enterprises	9
162	Michigan Radio	16
160	Micro Computer Concepts	69
144	Micro Control Specialities	16
114	Mr. Nicad	59
54	NCG	51,53
•	**Oklahoma Communication Center**	**88**
•	Omar Electronics	63
•	P.C. Electronics	49,81*
152	Pac-Comm	51
178	Pacific Cable Company Inc.	63
264	Palomar Telecom	63,65
288	Performance Electronics	47
68	Periphex	45
249	Phillips-Tech	67
66	Pipo Communications	63
49	Polyphaser	25
258	Polyphaser	65
145	QSO Software	71
132	Quement Electronics	57,77
24	Quorum Communications	68
58	Radio Engineers	47
279	RAI Enterprises	55
34	Ramsey Electronics	27*
254	Ross Distributing	55
71	Rutland Arrays	81
153	Satellite City	36*
36	Scrambling News	64
95	Sensible Solutions	41
•	Smith Design	43
250	Software Systems	42
244	Software Systems	75
183	Spectrum International	85
247	Startek	31
87	TCE Labs	42
232	TE Systems	22
124	Texas Bug Catcher Antenna	77
•	The Ham Center	85
150	The Radio Works	43
115	The RF Connection	59
62	TNR	67
299	Townsend Electronics	67
22	**Tri-Ex**	**71**
255	Tripp Lite	41
•	Universal Radio	63*
120	Van Gorden Engineering	55
104	VIS Study Guides, Inc.	67
•	Vanguard Labs	47
259	Versatel Communications	85
•	VHF Communications	85
191	W & W Associates	41
38	W9INN Antennas	59
292	Walker Scientific, Inc.	57
63	Wi-Comm Electronics	63
20	Wolfe Communications	47
•	Yaesu Electronics Corporation	COV3
•	**ZD Engineering**	**64**

Bold listings are 73's new advertisers this month.

*Advertisers who have contributed to the National Advisory Comittee(NIAC).

73 Amateur Radio Today

ICOM

READER SERVICE GIVE AWAY SWEEPSTAKES

oscribe now!

Yes! Send me 12 issues of *73 Magazine* e low rate of $19.97. (Save 43% off the r price.) ☐Bill me

☐MC ☐VISA ☐Payment Enclosed

#

Date

AUGUST 1991

ss

State Zip

Canada add $7.00 plus $1.40 GST;
Foreign add $19.00 surface, $42.00 airmail.

This card valid until October 31, 1991 in the U.S. and possessions.

make the *73* supporting advertisers happy when you're interested in them. . . . Wayne

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300

4ALK7

Where did you get this copy of *73*?
999A ☐ newsstand B ☐ subscription

READER SERVICE CARD

FREE INFORMATION

Reader Service: To receive more information on the products advertised in this issue of *73*, circle the appropriate number. Please allow 6 weeks for processing of inquiry. Offer valid in the U.S. and possessions for a limited time only.

73 Magazine Product Report Card

ase rate any ham gear you're using from (0) poor to (9) superb.

Manufacturer	Model	Your Rating	When Purchased	Notes

omments:

ase vote on the ad in this issue you nd most interesting:

Write Reader Service number here.

Name (Please Print) Call

Address

City State Zip

lease enter my one year subscription to *73* for the low price of $19.97 (Save 43% off the newsstand price).
this form or call toll free 1-800-289-0388. (In Colorado, call 303-447-9330)

ayment enclosed ☐Bill me Charge my: ☐MC ☐VISA ☐AMEX

Number Exp. Date 4ALE0

da add $7.00 plus $1.40 GST; Foreign add $19.00 surface, $42.00 airmail.

Place
Stamp
Here

73 Amateur
Radio Today
READER SERVICE MANAGEMENT DEPARTMENT
P.O. BOX 8569
BOULDER CO 80329-8569

Place
Stamp
Here

73 Amateur
Radio Today
EDITORIAL OFFICE
FOREST ROAD, PO BOX 278
HANCOCK NH 03449-0278

Never Say Die

Continued from page 4

band and every mode, even a USA report which mentions *Radio Fun*. There's 20 pages of DX news!

About the only thing they don't seem to have is something along the lines of my endless editorials. Probably just as well.

It's a magazine packed with interesting information, aimed at rank beginners right on through to experts, with the latest news and circuits for every special interest.

For us to have a similar publication here we'd have to have about 300 pages of advertising. In order for the ham industry to support that much advertising they'd have to sell about five times as much ham gear as they do now. And that would mean that we'd have to have about four times as many active hams buying.

Yes, Japan is *that* far ahead of us. They're leaving us further and further behind in radio technology. It's a terrible blow to American pride to be left in the dust, fiddling around with CW and AM instead of exploring the microwaves.

Many Americans have suffered severe inferiority attacks as we've had to learn about quality, just-in-time production and other Japanese innovations. Now it's no-code and the Luddites are at it again.

Mini-Discs?

Sony, apparently unable to keep from challenging Matsushita (and losing), has announced a new recording technology, the mini-disc (MD). This was in response to Philips and Matsushita's Digital Compact Cassette (DCC) announcement in January.

So what's all this mean to amateur radio? Isn't this just of interest to music lovers? What do we care if the Japanese come up with something to replace the old audio cassette? It's about time anyway, right?

Since analog audio will soon be as dead as spark, our analog voice transmissions are going to be as antique as our beloved CW. Amateur radio is already so far behind today's technology that it's more a museum exhibit of the past than a practical communications service.

The only main drawback to digital audio is that it takes a much wider bandwidth than analog. Let me see some hands now . . . how many of you are prepared to get up in front of the group and explain the difference between analog and digital? Hmmm, not many hands. I was afraid of that.

What we do is pick up analog audio with a microphone. Then we set up an oscillator and have it trigger on a sampling circuit. The audio on our compact discs (CDs) is sampled 44,100 times a second. A 16-bit byte allows you to break down the sound into 65,000 sound levels and represent each by a number. This makes it possible to digitize frequencies from 0–20,000 Hz . . . up to half the sampling rate.

For ham use we might want to cut down to a 6 kHz sampling rate, which would give us 0–3,000 Hz, plenty for ham communications, yet too wide for most of our ham bands. This is where we want to start looking for ways to compact the data. We don't need anywhere near the 80 dB of dynamic range demanded by music, so we don't need music's 16-bit bytes. We can further cut down the data rate by using one-bit technology. This, instead of giving us the signal level from zero to 120 dB for every sample, just tells us whether the data number is lower or higher.

Okay, okay, it's complicated and, unless you've been keeping up with electronic technology, it's confusing. I just wanted to give you some idea of what's going on, not make you a digital scientist. Not that all this is beyond the grasp of an eleven year old . . . it just may be beyond the grasp of the average 59-year old ham who is bewildered about what a decibel actually is.

How long do you think Congress and the FCC are going to consider amateur radio a resource worthy of using our incredibly valuable bands if we keep falling further and further behind in technology? When will they stop and consider that maybe they don't need to provide quite so much museum space for us to insult and jam each other with our antique frequency-wasting technologies?

Up until about 25 years ago, amateurs were the leaders in communications technology. We pioneered NBFM, SSB, SSTV, RTTY and repeaters. Then everything almost completely stopped, leaving us with a hobby frozen in time at around 1963. Was it entirely a coincidence that the ARRL's Incentive Licensing proposal almost completely stopped the entry of young newcomers at this same time?

The increasing complexity of home construction using ICs didn't help. Oldtimers, brought up on tubes, got scared off by these little gadgets and the enormously complex circuits they could build with them. I still fondly remember building rigs with 815s, 826s, 832s and 813s. Sigh.

We *will* be going digital. It's just a question of if we have to wait for the Japanese to pioneer it for us. And as we are able to get our effective bandwidths down to a few hertz, we're going to find ourselves with wide open bands, with acres of space between contacts . . . more like 40m CW used to be 60 years ago. When Sony is able to knock out 80% of the data for hi-fi music and we're not able to hear the difference, the possibilities for ham communications quality voice are staggering.

If there's any real interest, we can start encouraging the writing of technical articles to help you cope with 1990's technology instead of living in the glorious 1940's technology as most of you have. Do you want to know more about digital audio?

Where Was Wayne?

A couple readers noticed my absence at the Dallas hamfest this year. I was over in Sedalia (MO) at the 11th International Scott Joplin Ragtime Festival—same weekend.

Since I've been pretty good at keeping my love of ragtime music a secret, it may surprise you that I would fly to Kansas City and then drive to Sedalia, just to hear ragtime music. Four glorious days (and nights) of ragtime, played by the world's top ragtime performers . . . nirvana.

It didn't hurt that two of my proteges were on the program this year for the first time. Scott Kirby, who I discovered in New Orleans, and Masanobu Ikemia, who I discovered at Sedalia last year, when he was just there as an attendee and not on the program. This year they were the big hits of the festival . . . with me sitting there glowing like a proud papa.

The festival drew about 350 attendees. I'll bet over a hundred of them played at one time or another in the after-hours ragtime jam sessions . . . which went on after the last evening concerts until as late as 6 a.m.

Last year I missed the last two days of the festival and flew up Saturday morning to give a talk at the Dallas hamfest. Only a couple dozen hams managed to break away from the flea market to listen, so I figured I'd do better to spend my time in Sedalia this year.

With two ragtime CDs already released on my Greener Pastures label and two more in the works . . . plus several more planned . . . the festival was a business investment too.

The lack of interest in my Dallas talk last year means either that most hams have had enough of me in my editorials—maybe too much—or that my talks have grown dull. Probably the latter. When I'm giving talks to hams I often feel like a cheerleader trying to get some enthusiasm from the inmates of a nursing home. When I ask for a showing of hands on how many in the audience have done *anything* of interest in amateur radio, a couple hands go up. The others all slouch down and look guilty.

I don't know what to say. It's like a bunch of starving people not quite able to touch the fabulous feast just beyond their reach. Have you tried OSCAR? RTTY? SSTV? These 20-year old technologies are still newfangled stuff to many hams. Even packet is new! Lordy. Whatcha done on 220? 900? 1296? 10 GHz? Maybe 50 MHz? They didn't need me as a cheerleader at Dallas this year, just as a funeral director.

One of the top American ragtime pianists is Dick Zimmerman. He's also a professional magician. Perhaps I should take some magic lessons from him and at least be able to entertain you old-timers with some magic, even if you don't want to hear about amateur radio.

Beating the Pile-Ups

If you're one of the thousands of ops devoting the rest of your life on this world to adding QRM to pile-ups chasing DX, I have a suggestion for you. Are you interested in a sneaky way to come out on top of the pile-ups, time after time?

Yes, I know, you already have a twelve-element beam and a ten kW linear . . . but so do all your competitors. You need something extra to make it through the QRM. It's odd that you haven't thought of this already, but then perhaps you haven't gone about solving this problem creatively. Your use of 10,000 watts is a hint that you tend to try and use brute force instead of brains to get your way. I hate to think about your family relations!

Okay, here's the edge which should make all the difference. Perhaps you've noticed that when you are transmitting, this tends to reduce your ability to hear what's happening on your channel. You know there are others in there, but you don't know exactly when they are transmitting or how much they've shifted off the frequency to try and be heard. You need a way to listen while you are talking.

Think how great it would be to be able to tune in and hear what's going on while you're calling! You'd be able to shift your frequency enough to be heard. You'd be able to wait until just the right moment and both jam your competitors so the rare DX station wouldn't be able to get their call . . . and sandwich your own call in the instant they shut up.

Now that I've told you what you need to do, I'm sure you're way ahead of me on how to do it. You need a remote receiver with a UHF link back. If it's a few miles away you'll be able to hear your own frequency and everything on it. We have enough garbage on 2m already, so put your intercom channel up on a higher band. You'll want to be able to remotely tune too. But that's easy with many modern receivers. Duck soup.

How about some construction articles on remote receiving systems?

Some Trivia

You might watch for "Mission of the Shark," a TV movie which is planned for broadcast around December 7th. I don't know how good the movie is, but it was shot on my old submarine, the *USS Drum* (SS-228), where I spent the war. The *Drum* is tied up in Battleship Park in Mobile, right next to the *Alabama*, in case you're down that way.

The movie stars Stacy Keach as Captain McVay, skipper of the *Indianapolis*, and Richard Thomas (John-Boy) as the ship's doctor. The *Indianapolis* was sunk by a Japanese submarine (played by the *Drum*), with Japanese-American actors. The cruiser was returning from having delivered an atomic bomb when it was sunk. Most of the crew survived the sinking, but were subsequently lost to sharks during their several days in the water because a Navy bureaucratic blunder prevented anyone looking for them.

American Cars

A couple Detroit union member readers got all upset over my put-down of American cars a few months ago. They told me how great American cars are now. Glad to hear that, even though it goes against everything I've experienced with rentals.

Thus it was with some interest that I read a report in *USA Today* on how U.S. car brands had improved their quality. Ford did the best, moving from the 18th to 8th best trouble-free brand. Out of the top eleven most trouble-free 1991 models, Pontiac placed 7th with their 6000. The other 10 were all foreign. In the trouble-free brand list the first seven were Lexus, Infiniti, Toyota, Mercedes, Acura, Honda, Subaru . . . and then Ford. You can't believe how distressed I am to be so wrong about American cars being clunkers . . . and my Detroit readers so right. Yes, I'm being sarcastic.

I don't suppose I've gotten you to read *The New Yorker* yet. Pity. Damned shame. They had a very interesting series on Chinatown recently that was worth reading. We seem to get mad at the Asians for coming over here and working incredibly hard to succeed. They aren't doing anything we can't do, they're just doing what we won't do . . . work.

Heck, a lot of hams are furious with me because I've worked so hard and have succeeded as a result. I was lucky to have good role models. My father worked hard, as did my grandfather, so it seemed normal to me. My grandfather was one of the founders of Citgo and my father helped start the first trans-Atlantic airline.

And how does this apply to amateur radio? Why am I bringing this up here? Because it's the same pattern I see in

amateur radio . . . we want to buy a rig, put up a manufactured beam and tower and work the world. Thousands of readers get mad at me when I suggest they actually learn electronic and radio theory. They are ready with a rope when I suggest that if they love the damned code so much they get good at it and prove it. They are starting the fire under the tar when I ask why they aren't on packet yet. Or OSCAR. Shoot the messenger. No, I'm not saying that American amateurs are a lazy, spoiled bunch of old-timers. I would never say that. You might say it, and I wouldn't deny it, but I'm certainly not going to say it.

Now, if our beloved and wealthy, uneducated and apparently unskilled Detroit car makers would make some extra effort to turn out cars without defects I'll be delighted to start checking my gourmet library for crow recipes. Perhaps cooked in Ripple?

Education

Did you miss the *Forbes* articles on education (May 27th)? Tsk. Milton Friedman (one of my heroes) said, "On the average it costs half as much to run anything privately as it does governmentally." Friedman says that our Ivy League colleges could cut their tuitions in half and still make money if they were exposed to the disciplines of the market rather than counting upon government subsidies and big private donors. He says "that universities are multiproduct enterprises. They produce three major products: schooling, research and monuments."

One shining success is the DeVry Institute of Technology, which provides a better education than even state colleges and at half the price. Yes, of course state educational authorities are fighting DeVry at every turn.

You know, if we could ever get Congress to allow private mail, we'd see twice as much service at half the cost. I'm old enough to remember two mail deliveries on weekdays and one on Saturdays . . . 2¢ first class mail and penny postcards.

IBM Dying?

Several years ago I predicted that IBM would eventually get killed by microcomputers. If you've been reading the business magazines you've been seeing IBM losing ground at an amazing rate. It's going to get worse.

Just as we've had a drop in the cost of computing of about a thousand to one in the last few years, the predictions are for a further million-fold rise in cost effectiveness within a few more years. To some degree IBM will be able to sell more of the lower priced computers, but there's no way they can sell a million times more.

IBM makes most of their really big bucks leasing software. The day of the three-thousand-dollar-a-month software lease is going away, right along with the need for $10 million computers.

Ten years ago I had to pay $15,000 for a 10 megabyte disk for my Prime minicomputer. Now they're building 40 megabyte drives into laptop portables.

So what does this mean to amateur radio? It means you ain't seen nothin' yet when it comes to computerized communications. It also means there are going to be an enormous number of opportunities to make big bucks with these new computer systems. Small entrepreneurial companies are going to have a field day with support products, running circles around the giants. Small companies can react much faster than big ones and drive them bananas.

Chip densities are moving towards billions of transistors on a single chip. That means they can put dozens of ultra-fast microcomputers all on one chip, working in tandem. This is going to force a similar expansion in communications. We have the choice of being spellbound, dumb bystanders . . . or plunging in and benefiting from the changes.

This explosion of communications is going to start making frequencies more valuable . . . particularly the microwaves. This means, in turn, that either we're up there earning our salt or we're going to gradually be left like our American Indians, on tiny, unwanted reservations.

Of course, if we had friends in high places, we might be able to stave off the inevitable. And how can we develop some friends in high places? The same way the big corporations who want our frequencies do . . . by bribing Congress. We have a democracy here, and that means you pay or you die. For as little as $100 each per year to your senator and representative (for their re-election funds), you'll help assure that you have a louder voice at that old radio spectrum pork barrel than Motorola, G.E. or Fujitsu.

73's To You, Too

Sevens and threes to ya good buddy, as the southern truck driver CBers put it. No, you don't have to puzzle about where "73" came from, you jist pay 'tention to your old Uncle Wayne, and he'll put ya straight.

It has to do with the very beginnings of amateur radio, away back near hunnert years ago. Some of the first hams were old Morse ops who'd worked on the telegraph lines out West. Out there a man's most precious possession was his gun, the good old Winchester 73, the gun which opened the West. The old ops used to end their messages with "I will you my 73." That got shortened, in true CB style, to "73," and meant "best wishes." You can tell if a ham is a lid if he pluralizes it. It ain't "best regardses," it's "73." Now aren't you glad you have old Uncle Wayne as a living link with the past . . . good buddy?

The next thing you'll be asking me where "88" came from. Git off the porch and let a cranky old man alone. Jeeze, these danged kids. Worse'n all those testy old men on CW bumbling along in 10 wpm horsecarts in a day of 25,000 wpm supersonic technology . . . and complaining about the fast drivers.

And while hams are fighting to keep bleeping at each other on CW, technology is moving ahead. In-flight phones in every seat are being tested on U.S. Air, Northwest and American Airlines. These phones use digital technology to encode the voice, plus they'll work with your laptop computer and even handle fax right there in your airline seat. You'll be able to make plane reservations, page friends on the ground, get stock quotes, read news headlines, look up flight schedules and so on. Now tell me again about how CW can get through when all else fails . . . I need to hear about that again to retain my failing faith.

Saudi Arabia

The Arabs, not just in Saudi Arabia but in all Arab countries, have one whale of a problem. And it's a problem which is going to make for wars for a long time to come.

If one asks how come the Arabs were way ahead in science and technology a thousand years ago and then stopped, I think the sad answer lies in their religion, Islam. Islam is against paying interest, which means that any fundamentalist Moslem society will never have the capital to grow. Few businesses can get started without borrowing money. We're talking about a religion which is anti-capitalist and thus dooms any country which is limited by it to failure . . . just as the communist countries failed.

And as if that weren't bad enough, Islam is also against technology. Science teachers in fundamentalist Islam countries find they must graduate Moslem students, whether they know anything or not. A ham visiting Saudi Arabia reports that the Aramco Saudi technicians spend their days in idle gossip and drinking tea. When something breaks they have to call an American supervisor.

I realize that it's blasphemous to question any aspect of a religion, even one which is a thousand years out of date and is keeping its believers in poverty . . . except for those families lucky enough to live on top of an oil field. I'm not suggesting that Moslems consider changing Islam, only that they stop being jealous of the wealth the rest of the world gains through technical education and using technology.

If you ever wondered why almost the only ham contacts you've made in the Middle East have been with Americans, now you know.

I've been interested in the growing number of articles about Kuwait and Saudi Arabia and their medieval societies . . . which we've just spent a few billion dollars rescuing from an old friend of theirs. I'm glad we lost fewer Americans doing it than we lose on a good night to crack-related killings.

I asked for some ham volunteers to follow our troops into Baghdad and set up some health and welfare stations. Several hams were ready to go. Alas, our troops stopped before entering Baghdad, a fact which General Schwartzkopf made plain was a bummer in his mind. It looks as though history has already backed him up. Anyway, I was very glad to see a few hams willing to pitch in to help out at their own cost.

Say, if you think I'm exaggerating about the hold religion has over there, just remember back to the Iranian mobs waving their fists at us on the evening news a few years ago. And the thousands of Iraqis doing ditto last year.

Free Cellular Calls

Well, free, if you don't get caught. I mentioned a couple years ago that most crooks were using cellular phones with altered serial numbered identification chips. The result is free phone calls . . . anywhere in the world.

A recent *Wall Street Journal* article tracked it all down to a computer hacker named Ken Bailey, who took a cellular phone apart and cracked the code. Ken, the *WSJ* claimed, was circumspect about it. He made bogus chips, but built in a security system so no one could make a copy of his chip and use it. They'd have to come to Ken for chips.

That worked fine until Ken's computer went on the fritz one night and he asked a friend, Bob Sutton, to help him fix it. In the process Bob came across the program and, being no fool, ran off a copy. Alas, he didn't copy the security check, so when he began popping chips for others, they had no problem making further copies. The cellular industry estimates they may lose around $600 million next year to these little buggers. Hmmm, now don't you wish you'd paid more attention when I told you to learn about computers a few years ago?

For those of my readers whose sense of humor rotted off through disuse, I'm not supportive of stealing phone services. But then I can't forget that America's wunderkind, Steve Jobs, got his start in business selling blue boxes to steal phone services from Ma Bell. And who's Jobs? He's the billionaire Apple computer alumnus. If it hadn't been for blue boxes and theft of services from Ma, we wouldn't have all those nice Macintoshes around. Who was it said crime doesn't pay? It wasn't the Mafia, that's for sure.

Zzzzzzz . . .

Y'ever lay there awake, your mind churning, wishing you could saw zees? What would you pay for a dose of Old Doc Green's Insomnia Cure? Tell you what, if I give you the recipe and you find it works, all you owe me is one extra subscription to *73*. Fair enough?

Heck, this pound of cure is so powerful it'll put you to sleep in a dentist's waiting room. I use it to whup me into the Land of Nod on airplanes . . . something I never used to be able to do. We're talking industrial strength here.

No, it's not addictive. No, it doesn't have any bad side effects. No, it's not hypnotism . . . though that'll work pretty well too. Nope, what I've got is a system that's so simple and so incredibly obvious that you're going to be annoyed that you didn't think of it yourself.

Okay, I'll stop teasing you and let you in on the big secret . . . but don't forget the price. Once you've learned how to do this and you find it works like magic for you, which it will . . . heck, it can't fail . . . you owe me an extra *73* subscription. That means you're going to find another ham and get him or her to subscribe . . . or buy a gift subscription for a DX ham who can't afford one. If this is too hard a bargain, please stop reading right here. A deal is a deal, right?

Here's how it works. You're going to set up a habit pattern which will automatically put you to sleep. Yep, a simple Pavlovian stimulus/response deal. If you aren't up on Pavlov, it's because you have been poorly educated. And don't blame the schools, you're the main one responsible for your education, not our lousy schools.

From now on, every time you go to bed at night get into the same sleeping position. Find a comfortable position and use that every night. You're going to establish a habit. You're going to have your body recognize this position and start generating endorphins as soon as you assume the position.

No, that isn't all. That's not going to knock you out in an airline seat where you can't get into that position. But it's a way to get started with training your mind/body to go to sleep.

Step two is to choose a sound to repeat a few times every night as you go to sleep. Pick something euphonic like umm, oom, ooze, ahm, ease, or moo. Just say it a few times as you drift off to sleep. Hey, this isn't going to work if you try to use it to get to sleep when you are keyed up. Start breaking in the system when you are tired and will naturally go to sleep. We're building a habit pattern here.

After a few weeks the combination of falling asleep and the sound you've chosen as a mantra will be tied together and you'll find that your mantra will, more and more, help you fall asleep, even in circumstances where you'd ordinarily find it difficult or even impossible.

Continued on p. 77

Enjoy NEVER CLIMBING YOUR TOWER AGAIN

Are you too scared or too old to climb? Never climb again with this tower and elevator tram system. Voyager towers are 13 and 18 inch triangular structures stackable to any height in 7 1/2', 8 3/4' or 10' section lengths. Easy to install hinge base, walk up erection. Next plumb tower with leveling bolts in base. Mount rotor and large heavy beams on Hazer tram and with one hand winch to top of tower for normal operating position. Safety lock system operates while raising or lowering. At last a cheap, convenient and safe way to install and maintain your beam. This is a deluxe tower system that you can enjoy today.

SPECIAL TOWER PACKAGE: 50 ft. high by 18" face tower kit, concrete footing section, hinged base, HAZER kit, Phillystran guy wires, turnbuckles, earth screw anchors, 10' mast, thrust bearing, tool kit, ground rod and clamp, rated at 15 sq. ft. antenna load @ 100 MPH, **$1974.95.**

50' by 13" wide tower, same pkg as above	**$1670.95**
HAZER 2 for Rohn 25-hvy duty alum 12 sq ft wind ld	**324.95**
HAZER 3 for Rohn 25-std alum 8 sq ft wind load	**232.95**
HAZER 4 for Rohn 25-hvy galv stl 16 sq ft wind ld	**303.95**
TB-25 Ball thrust bearing, 2½" max mast dia.	**74.95**
NEW NEW NEW NEW NEW	
HAZER VH-8 Transit System for Rohn 45, 22 sq ft wind load	**860.00**
HAZER VH-9 Transit System for Rohn 55, 22 sq ft wind load	**895.00**

Satisfaction guaranteed. Call today and order by Visa, M/C or mail check. Immediate delivery.

Glen Martin Engineering, Inc.
Dept. A
RR 3, Box 322,
Boonville, MO 65233
816-882-2734
FAX: 816-882-7200

GLEN MARTIN ENGINEERING

CIRCLE 72 ON READER SERVICE CARD

HamBase™

Data Retrieval Software

- Contains 501,906 US licensees.
- Name, address, class, and year of birth.
- Instant retrieval on Macintosh or PC.
- Unlimited export to any database.
- Use with a hard disk, or from diskette.
- 100% verified on high quality diskettes.

PC 5.25"	PC 3.5"	Macintosh® 800K
1.2Meg (17) $69.95	1.44Meg (14) $79.95	25 disks $79.95

Add $5 shipping and handling. CA residents add 7% sales tax. Call for other disk formats.

VISA® MasterCard

1922-1990

Find: W2NSD
Wayne Green II
WGE Center
Peterborough NH 03458
Class: Advanced
Born: 1922

1991-...

j-Com · P O Box 194 T · Ben Lomond · CA · 95005 · (408) 335-9120

CIRCLE 270 ON READER SERVICE CARD

ASSOCIATED RADIO

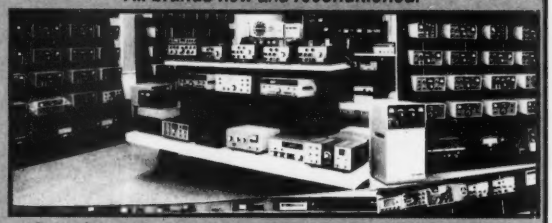
8012 CONSER BOX 4327
OVERLAND PARK, KANSAS 66204

CALL 913-381-5900
FAX 913-648-3020

BUY—SELL—TRADE
All brands new and reconditioned.

EVERY DAY A HAMFEST

WE'LL BUY YOUR EXTRA RIG STATIONS - ESTATES ETC.



Send $3.00 for our current catalog and wholesale sheet.

PC SWL $99.00

A Complete Digital Reception System

PC SWL contains the hardware, software, instructions and frequency lists needed to allow you to receive a vast variety of digital broadcasts transmitted over shortwave radio. All you need is any IBM PC or compatible computer and an SSB shortwave receiver. The product consists of:

Demodulator
Digital Signal Processing Software
80 Page Tutorial Reference Manual
World Press Frequency List
Tutorial Audio Cassette with Samples

PC SWL automatically decodes Morse code, Radio Teletype, FEC (forward error correcting code), SELCAL (selective calling transmissions), and NAVTEX.

PC SWL lets you tune in on world press services with up to the minute news, meteorological broadcasts, ham radio operators, coastal shore stations, aviation telex and much more digital action on the shortwave bands. Find all the utility station action you have been missing.

PC SWL software uses the processor in your PC to do the work, why pay for another expensive box when a simple interface and your PC and do the job?

ADVANCED FEATURES:
Tuning Oscilloscope
Digital Waveform Presentations
Auto Calibration and Code Recognition
Continuously Tunable Filter Frequencies
Variable Shift
Adjustable CW Filter Sensitivity
Farnsworth Code Compatibility
Unattended Capture and Printing

Call or write for a complete catalog of products.

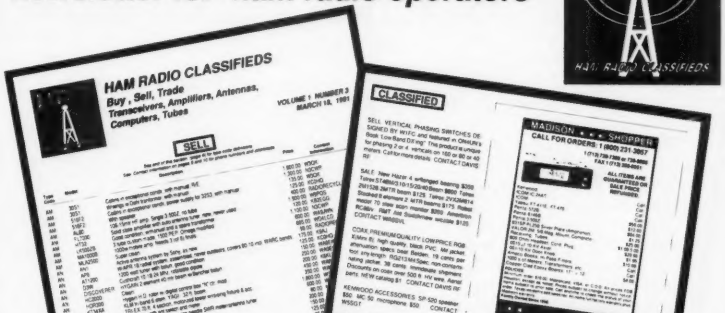
Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
Tel:(714)498-5784 Fax:(714)498-0568

CIRCLE 244 ON READER SERVICE CARD

HAM RADIO CLASSIFIEDS

the bi-weekly classified newsletter for ham radio operators

HRC
HAM RADIO CLASSIFIEDS



BUY — SELL — TRADE
Transceivers, Amplifiers, Antennas, Computers, Tubes

CALL OR WRITE FOR YOUR *FREE* COPY!
708/475-7802
739 Dobson St., Evanston, IL 60202
The best rates, with the best readership.

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

Field Day has come and gone, and I didn't make it to Colorado like I did last year. I did get an invitation, but I had to refuse because my schedule just wouldn't permit it, though I did make it to the High Country in July.

My big ham project for the summer was to make my one-legged 160m dipole into an honest two-legged 160m inverted vee. A very tall tree between my house and the property next door became available for the center support, so out came the bow and arrow, and it happened. What a difference!

It appears that we will start hearing from Australia again in the near future. David Horsfall VK2KFU has volunteered his services to bring us the news from Down Under. David is a member of the WIA, and during the last few years has served on Executive. He produces the weekly broadcasts for the WIA (VK2 Division). Welcome, David. We look forward to your contributions.—Arnie N1BAC.

Roundup

Colombia The Colombian League of Radio Amateurs is sponsoring The Colombian Independence Day Contest. The contest will be held between 0000 and 2400 UTC on Saturday of the third weekend in July (July 20, 1991). For further information, contact: Liga Colombiana de Radioaficionados, The Colombian Independence Day Contest, P.O. Box 584, Bogota, Colombia, South America OR see the the 73BBS 73 International SIG (Colombian Independence Day Contest).

India VU2RG is a Silent Key. Who, might you ask, is VU2RG? He was in the limelight for many years, but certainly was not known for his work as a ham. VU2RG was Rajiv Gandhi, prime minister of India from 1984 to 1989, grandson of Hawaharlal Nehru, India's first prime minister, and son of Indira Gandhi, who ruled India for 15 years.

Gandhi, leader of the powerful Congress Party in India, was killed by a female suicide assassin as he was attempting to regain the position that he had lost in 1989.

The National Institute of Amateur Radio (NIAR) and the Bangalore Club Station, VU2NRJ, are sponsoring the Garden City Award. This award is continuous after March 1, 1991, and further information may be received from NIAR-HQ at Hyderabad, by writing NAGESH (VU2NUD), P.O. Box 5624, Bangalore-560010, India; OR you can download the information from the 73 International SIG (Garden City Award).

Japan From the JARL News: The Amateur Radio Festival, popularly known as Ham Fair, will be held on August 23, 24, and 25 this year under the auspices of JARL at the Tokyo International Trade Center Annex in Harumi, Tokyo, the same location as last year.

The theme this year is "Freshen-up Ham Life" and the catch-phrase is "Let's meet at Harumi under the glittering sunshine." A special event will be "Multi-band Know-how." Bring along a friend and join in the fun and frolic!

Switzerland From the International Telecommunication Union (ITU) Press Release: The most recent press release published in connection with the 23rd World Communication Day includes a feature by the United Nations Disaster Relief Office (UNDRO) on disaster preparedness and relief telecommunications. Included were the views of the Secretary-General of the League of Red Cross and Red Crescent Societies on the need to enhance the quality of information in disaster relief operations.

Key issues concerned taking a critical look at the quality, as well as the quantity, of information; facing up to the general failure of disaster agencies to communicate adequately with disaster victims; appreciating the mass media's involvement in disaster situations and ensuring that the media reflects the nature of disasters accurately.

Information scientists stress six attributes of useful information: clarity, accuracy, significance, timeliness, adequacy, and validity. Those dealing with communications from disaster areas must keep these attributes foremost in their thoughts if their information is to do any good.

USSR A quick note came from Serge UA9SAW on some of his DXpedition activities. He mentioned two DXpeditions: on 6–16 September 1989 as UL1K/UA9SAW in OBL024, and on 4–21 September 1990 as UH1E/UA9SAW from OBL044. Please QSL direct: Serge P. Klyushnikov, UA9SAW, P.O. Box 13, Gaj, Orenb. Obl., 462630, Russia, USSR (CCCP).

The following letter was received from Ken Carpenter KC4UG: "I always enjoy '73 International.' Since I have learned to speak Russian I have made many friends there, and receive a great deal of information about their ham activity. I plan to attend the hamfests in Leningrad and Omsk in August of this year. *[Say hello to Gene (Gennady) UA9MA and all the other hams from all of us at 73. We loved the awards he sent to us several years ago which were printed in this column.—Arnie]*

"I received the following from Serge EKØKBZ, 4K4/UAØKBZ and UAØKBZ. Serge operated EKØKBZ for the Big Circle Dog Sled expedition in 1990. He made over 6,000 contacts, but only received 200 QSLs because he couldn't receive his cards via Box 88 in Moscow. He is located in remote Cape Schmidt in the Arctic.

"His card is a beautiful three-part QSL with scenes of the sled teams in the arctic, the best I have seen from the USSR. He wants QSLs direct with two IRCs or, better yet, one green stamp. His address is: Serge Tsybizov UAØKBZ, P.O. Box DX, Cape Schmidt, Magadan Oblast, 686830 USSR.

"He also sent me information about the Soviet callbook. It has over 20,000 addresses and more than 400 local Russian QSL bureau addresses. It is available from: Giusppe Iannuzzi I8IYW, P.O. Box 5083, 80144 Napoli, Italy. The cost is $6 US, postpaid airmail.

"The mail from Russia is getting slower each month, and a card via their bureau is almost impossible. At one time I was receiving mail from Russia in two weeks, but now it takes up to two months, air mail!

"I sent Mike UA9MI an MFJ packet TNC last year. He and Gene UA9MA are on HF packet from Omsk, Western Siberia. They are the only ones from that area on packet at this time. 73, Ken KC4UG."

SPAIN

Woodson Gannaway N5KVB/EA8
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de G.C.)
Islas Canarias, Espana

Carnaval Gaditano

Hi to Arnie and All. Paco EA7CZR sends some QSL cards from the Carnaval de Cadiz, and an announcement he would like presented to our readers:

I am Francisco Ramos EA7CZR and EA7FR, from the city of Cadiz, southern Spain. *["Paco" is short for "Francisco."—Eds.]* I am enclosing some QSL cards from ED7TDP, a special call used during the Mardi Gras in Cadiz. The meaning of TDP is Tacita De Plata (silver cap), the nickname of Cadiz city.

The Union de Radioaficionados de Cadiz, Seccion Local de la URE, (the local section of the Cadiz Radio Club) is sponsored by the Fundacion Gaditana del Carnaval (Mardi Gras Fundation) from the EXCMO, Ayuntamiento de Cadiz (City Hall of Cadiz), since 1985. Every following year, the OMs

Fundación Gaditana del Carnaval
Excmo. Ayuntamiento de Cádiz
ZONA CQ 14 - ITU - 37 - LOC. IM 66 UM
Unión de Radioaficionados de Cádiz
Sección Local de la U.R.E.
Apartado 2.271 - CADIZ 11080 - ESPAÑA

DE:

ESTACION	CONFIRMANDO QSO				
	FECHA	UTC	RST	MHz	MODO 2X
					CW - FM SSB

PSE – QSL – TNX CORDIALES 73 Y DX's

Photo A. The 1991 QSL card sent to contacts with ED7TDP during the Carnaval Gaditano (Mardi Gras in Cadiz).

from Cadiz have used this special callsign on the air.

During 1991, we awarded the people who sent to us confirmation of contacts performed with ED7TDP, during three consecutive years in SSB/CW or mixed, an engraved medal to thank them for being with us every year during the Carnaval Gaditano. 73, Paco EA7CZR. *[Each year's QSL has a different beautiful poster."—Arnie]*

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
D.N. Hanagev 85530
Israel
PACKET: 4X1MK@4X4SV.ISR.EU

Techsat I—Israel's First Hamsat

AMSAT-Israel, in cooperation with the Technion University of Haifa and the Asher Institute for Space Research, is building an amateur radio satellite. Most of those working on the bird are volunteers and students giving of their spare time in this on-going project to build smart satellites for the amateur radio community.

Techsat I is to support digital store-and-forward communications with an onboard packet BBS. The bird will fly in a polar low-earth-orbit (LEO) approximately 450 miles up. Because of the polar orbit (similar to the Microsats), everyone on earth will have a shot at the bird.

Two transmitters are planned for both telemetry and downlinking, and will work on 435 and 29 MHz. Uplink receivers will have five frequencies on 145 MHz, five channels on the 1260 MHz, and yet another five frequencies on 2400 MHz. As well as supporting PSK and FSK, the system will have FM AFSK capabilities, meaning that stations equipped with standard packet TNCs will be able to access the orbiting BBS. (PSK, Phase Shift Keying, which requires a special modem on the TNC, is much more efficient and effective for hamsat packeteering, but the FM AFSK mode is being provided to give "beginners" a taste!)

Hams involved in the project are Peleg Lapid 4X1GP, system designer, 'Oved Ben Aroya 4X4LS, software designer, and Shlomo Menuhin 4X1AS, IARC/AMSAT-IL coordinator.

Launch is planned for 1993 on an Ariane rocket. A scientific experiment, possibly in radio navigation, is also intended. Work at the present is still in the planning stage, but is reported to be in high gear. Wishes of Godspeed to the folks at the Technion University working on the project, with the hope that they will be successful in providing the international amateur community with another reliable hamsat. 73

Never Say Die

Continued from p. 74

Pavlov rang a bell every time he fed his dogs. After a while he found that just ringing the bell started their digestive juices flowing. So why not use this mechanism to help you go to sleep? It works! And it doesn't take very long to build this new and helpful habit pattern. There's no downside to this.

I used to hate long airline trips because I'd sit there wanting to sleep and just sit there hating every minute of it. Now I can doze off in seconds and wake up an hour later refreshed. Yes, I suppose I cheat a little. I do take along a sleeping mask to block out the bright lights or the movie. And I put in a pair of those foam yellow ear plugs to cut down the noise from the people talking across the aisle. And I take along an inflatable pillow that goes around my neck. The whole works fits into a small bag which I carry on with my laptop computer and reading material. The pillows are sold through several mail order houses for a few bucks and they work beautifully. I have the same travel package in my van so I can grab a few zees on trips. No, I'm not driving.

Most of us are able to get to sleep most of the time without any great problems. But every now and then we find that our mind is racing and we just lay there twisting and turning. This can be particularly frustrating if you've got an important day ahead and you really need that sleep.

Start building your sleep habit pattern so it'll be there when you need it. I've been taking afternoon naps for years. I find they make it possible for me to work smarter and harder late into the evening. This zonking system is priceless for getting me to sleep in a few seconds when I take a nap. I assume the position, say the word, and I'm out for almost exactly one hour.

By the way, you can train yourself to sleep exactly as long as you want too. The mind has an amazing ability to keep track of time. It works on a subconscious level. When I go to sleep I decide when I want to wake up...45 minutes, an hour...and bingo, I'm awake...usually within the exact minute. It works for long naps too. When I have to be up at a specific time and set my alarm, I almost always wake up about a half minute before the alarm goes off.

How much sleep should you get? That's a habit too. Some people get along fine on four or five hours. Others are habituated to eight to ten hours. I've got too much I want to do to waste time sleeping that isn't needed, so I generally go about five hours at night and one in the afternoon. Works for me.

Try my system and it'll work. Then start looking for a ham or prospective ham who needs a monthly shot of enthusiasm and get him (or her) to subscribe to *73*. I positively refuse to get upset if you find this so helpful that you feel obliged to wrestle up two subscriptions. 73

QUEMENT

Talk With The Knowledgeable People At

QUEMENT ELECTRONICS

We Carry A Full Line Of Popular And "Hard To Find" ICOM Products!

ICOM

IC-229A . . .$396
Compact 2M Mobile

- IC 901A Mobile Transceiver $929
- UX-39A 220 Mhz band unit $309
- UX-49A 440 Mhz band unit $328
- UX-29H Hi Power 2m band unit $328
- IC970H All mode 2m 70cm base $2699
- UX-R96 Receiver unit $389
- IC-3220A Compact 2m/70cm mobile unit $579

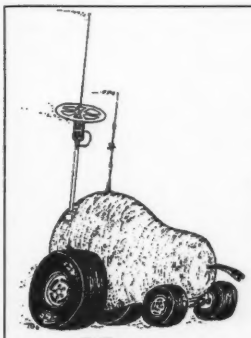
Since 1933, we have been providing expertise and quality products to generations of hams.

If you're in the Bay Area, stop by:

1000 SOUTH BASCOM AVE.,
SAN JOSE CA 95128
Call Us At (408) 998-5900

CIRCLE 132 ON READER SERVICE CARD

THE GREAT MOBILE PEAR



THE
TEXAS BUGCATCHER
HF Mobile Antenna System

- Hi Q air-wound coils
- Minimum SWR—excellent performance on all HF bands
- Easy assembly to meet almost any configuration
- Fits standard 3/8-24 SAE mounts
- Various length base masts & whips available

Henry Allen WB5TYD
214–388–4724 8 am–4 pm weekdays
903–527–4163 evenings & weekends

Send for free brochure!

GLA Systems
PO Box 425
Caddo Mills, TX 75005

COMET
ANTENNAS FOR THE PROFESSIONAL AMATEUR

CPR-5800

Dual-Bander 146/446MHz
Gold plated center conductor for excellent electrical efficiency!

Wave Length: 146MHz 7/8 Wave
446MHz 5/8 Wx3

Gain: 146MHz 5.0dB
446MHz 7.6dB

Impedance: 50 ohms

VSWR: 1.5:1 or less

Max. Power: 120 watts

Length: 5'

Connector: UHF

CIRCLE 124 ON READER SERVICE CARD

SIMPLEX REPEATER

USE ONE RADIO AND ONE SIMPLEX FREQUENCY

The Simplex Repeater will automatically record and playback a message. When the (SR3) Simplex Repeater detects a carrier it will begin to digitally record the audio being received by the radio you have connected it to. When the carrier drops, the SR3 stops recording, and key's the radio (PTT) and transmits the audio it just recorded. This allows two or more mobiles to have a simplex conversation, when they are not in range of one another, but in range of the simplex repeater site.

- NO DUPLEXER NEEDED
- VOICE MAIL
- VOICE IDer
- DTMF REMOTE PROGRAMABLE
- REMOTE FUNCTIONS
- AUX. RELAY OPTION

$329 WITH PL DECODER INSTALLED

$229 WITHOUT PL DECODER

BRAINSTORM ENGINEERING
(818)249-4383
7 DAYS A WEEK

CIRCLE 197 ON READER SERVICE CARD

NOW YOU CAN USE THAT 75 OHM HARD LINE

Yes, that LOW LOSS semi-rigid, 1/2 inch, co-axial cable, used by the cable TV companies can now be easily used for feeding VHF and UHF antennas.

These HIGH QUALITY, LOW COST connectors and Linear Matching Transformers are especially designed for easy conection to the ALUMINUM sheilded co-ax that can be obtained (sometimes for the asking) from the local cable company.

UHF series connectors:
Male: HLC-75-UHF-M (PL-259 type) ... $ 5.95 ea.
Female: HLC-75-UHF-F (SO-239 type) .. $ 5.95 ea.

Linear Matching Transformers:
144-148 Mhz: LMT-146-75-52-UHF .....$ 24.95 ea.
222-225 Mhz: LMT-223-75-52-UHF .....$ 23.95 ea.
430-440 Mhz: LMT-432-75-52-UHF .....$ 22.95 ea.
440-450 Mhz: LMT-445-75-52-UHF .....$ 22.95 ea.

Add $.50 S&H per connector / $3.00 S&H per LMT
(Illinois residents add 6.25% sales tax.)

ANT-Ventures
P.O. Box 776
McHenry, IL 60050
815-344-1702
Dealer Inquiries invited.

CIRCLE 18 ON READER SERVICE CARD

GIVE YOUR
HR-2510 HR-2600
the same features as the
"BIG RIGS"

- 30 Memory Channels
- Automatic Repeater Offset
- Programmable Transmit Timeout
- Programmable Seek/Scan (5 Khz,etc)
- Programmable Mike/Channel Buttons
- Programmable Transmit Freq. Limits
- Extended Frequency Range (10 to 12 meters)
- Priority Channel
- Split Frequency
- Many More Features

All these features by replacing your radio's existing "CPU" chip!
(Priority Channel requires optional hardware)

$59.95 (Optional Chip Socket $7.50)
Includes Operator's and Installation Manuals

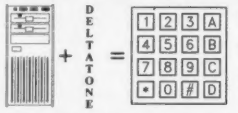
CHIPSWITCH©
4773 Sonoma Hwy. Suite 132
Santa Rosa, CA 95409-4269
Write or call (707) 539-0512 for free information
Quantity prices available, Dealer inquires welcome

CIRCLE 265 ON READER SERVICE CARD

ATTENTION REPEATER OWNERS—DELTATONE™ 2.0
The Ultimate 16-Digit DTMF Repeater Programmer

DELTATONE™ 2.0, the perfect complement to your repeater controller investment. DELTATONE and your MS-DOS computer offer unlimited 16-digit tone generation for local or remote programming of your repeater controller. DELTATONE accepts programming commands from a file created using your favorite word processor. Commands and comments can be freely mixed within the file. DELTATONE's intelligent device driver conveniently sends only the commands to the DELTATONE interface via your printer port.

- Effortless installation program
- DTMFTONE.SYS intelligent device driver uses less than 2K system memory
- Interfaces with LPT1, LPT2 or LPT3 printer ports without interfering with normal printer operation.



- Transformer coupled, balanced 600 ohm adjustable to -10 dbm output level.
- Software controlled relay contacts for PTT or COR switching.
- Easy 4-wire connection interfaces directly to controller, radio or user supplied approved telephone coupler.

You simply won't find a more flexible and powerful hardware/software package for generating DTMF tones. **30-DAY MONEY-BACK GUARANTEE.** We'll even guarantee your complete satisfaction with DELTATONE in 30 days, or return it for your money back. It's your opportunity to put the power of DELTATONE 2.0 to work for you — RISK FREE!

$149 Includes Interface / Software
Check, MO, VISA or MASTER
Accepted • $4 for S&H
(WI Res. Add 5% Sales Tax)

DELTA RESEARCH
PO Box 13677 • Wauwatosa, WI 53213
FAX or Phone Weekdays (414) 353-4567

CIRCLE 257 ON READER SERVICE CARD

WHEN DOES ONE EQUAL TWO?
WHEN IT'S A TAD M8 FM TRANSCEIVER
COMMERCIAL & AMATEUR BANDS IN ONE UNIT

- Ideal for MARS, Vol. Fire, EMT, B'cast RPU, Police, etc.
- Fully Field Programmable
- 99 Channels
- True 40 Watt Power
- Extremely Rugged
- Multi Function LCD display
- Frequency Range 138-174 or 430-480 mHz
- FCC & DOC type accept.
- Low Cost DTMF mike avail.
- Overnight Shipping Available
- Shipped Complete w/Mike, Mobile Slide Mount & Power Cable
- Base Station P.S. Mobile Antennas etc. in stock

Dealer Inquiries Invited

AXM Incorporated
11791 Loara St.
Garden Grove, CA 92640-2321
Write or Call 714-638-8807 for immediate information

CIRCLE 243 ON READER SERVICE CARD

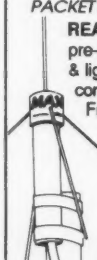
Bandmaster Quads

QSO more for greater distance, higher gain and less interference with AAE Bandmaster Quads. Call or write today for free brochure on the world famous UHF, VHF, HF 2, 3, 4, and 6 element quads.•All-fiberglass construction•Rugged engineering•All weather•Highly directional •Excellent F/B •Packet powerhouse •Tool-free assembly •1 year replacement warranty •VISA or Mastercard welcome •Custom orders. **Alabama Amateur Electronics**•3164 Cahaba Heights Road•B'ham, AL 35243

205 967-6122

CIRCLE 253 ON READER SERVICE CARD

The Best Value
PACKET RADIO • REPEATERS • PORTABLE



READY-TO-GO - Pre-assembled & pre-tuned • **RUGGED** - Stainless steel & lightwt.• **DEPENDABLE** - Water & corrosion-proof • **PROVEN DESIGN** - From ARRL Handbook, highest qlty. materials and workmanship.

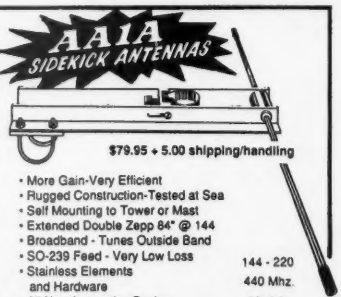
Only **$29.95** Free shipping (cont. USA)

Money back guarantee.
Specify MAX146, MAX220, or MAX440

MAX *System™*
GROUND PLANE ANTENNAS
CK-MO-MC-VISA Accepted (MA add 5% sales tax)

Send payment to: Cellular Security Group,
4 Gerring Rd., Gloucester, MA 01930
Or charge by phone (508) 281-8892

AAIA SIDEKICK ANTENNAS



$79.95 + 5.00 shipping/handling

- More Gain-Very Efficient
- Rugged Construction-Tested at Sea
- Self Mounting to Tower or Mast
- Extended Double Zepp 84" @ 144
- Broadband - Tunes Outside Band
- SO-239 Feed - Very Low Loss
- Stainless Elements and Hardware
- All New Innovative Design
- Customers Report Very Positive

144 - 220
440 Mhz.
Models

Order Direct 1-800-874-2880
VISA-MC OK No Extra Charge
BROADCAST TECHNICAL SERVICES
11 Walnut St., Marshfield, MA 02050

CIRCLE 84 ON READER SERVICE CARD

INTERFERENCE LOCATION

- ★ 50 to 1000 MHZ
- ★ Stuck Microphones
- ★ Cable TV Leaks
- ★ Jammed Repeaters & Cell Sites

New Technology (patented) converts any VHF or UHF FM receiver into a sensitive Doppler shift radio direction finder. Simply plug into receiver's antenna and external speaker jacks. Models available with computer interface, synthesized speech, fixed site or mobile - 50 MHz to 1 GHz. Call or write for details.

DOPPLER SYSTEMS, INC.
P.O. Box 31819
Phoenix, AZ 85046
(602) 488-9755
FAX (602) 488-1295

CIRCLE 13 ON READER SERVICE CARD

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
%73 Magazine
Forest Rd.
Hancock NH 03449

Keep on Switchin'

Last month, we were exploring switches and controls. Let's finish that up and move on to a new topic.

Microswitches really aren't all that small by today's standards. I suppose they must have seemed tiny compared to other switches when they were first introduced. We continue to call them microswitches, partly out of tradition, but also because a company called Microswitch, Inc., makes many of them.

The distinguishing characteristics of a microswitch are that it is rectangular and it is operated via a small plastic button near one end. Often, there is a lever arm mounted on the switch body, permitting a small force to operate the switch. This type of switch makes a distinctive "click" when it is pressed, and another when released.

The internal construction consists of several strips of metal arranged to provide a "snap" action which presses the contacts together. This action is what causes the click. I've seen a few microswitches with broken strips and a few with burned or corroded contacts. If there's no click, the strip is gone. If you hear the click but get no connection, suspect the contacts.

Although it is sometimes possible to break a switch open and clean burned contacts, it really isn't worth it. These switches are nearly all of one or two designs, and are easily replaced. In fact, Radio Shack sells two versions. And, of course, the mail order outlets have them. Don't waste your time—get a new switch!

You're Relay Switching Now

Relays, of course, are just magnetically operated switches. In my experience, they are among the most trouble-prone switching devices of all. Although coils can open now and then, the usual problem is poor connection at the switching contacts. The techniques for general contact cleaning I discussed last month apply here as well. Also, try soaking a piece of paper in contact cleaner (*not* the corrosive acidic kind) and pulling it between the contacts while you hold them closed. You may be surprised at how much gunk is deposited on the paper. In addition, check to make sure that the arms on which the contacts are mounted are not bent or sagging. Sometimes they just don't exert enough pressure.

I've had some frustrating times with relays. I've wasted more than a few hours trying to get an intermittent relay to work every time. Especially when low signal levels are involved, such as in TX/RX switching, the connection has to be very good, and some old relays just won't do it no matter how hard I work on them. If you run into this, try to get a new relay; it just isn't worth the misery to try to fix it.

By the way, always check the solder joints where the relay connects to the board. The heat-sinking effect of the large connections sometimes causes them to be soldered poorly at the factory. They may last for a few years, but they will eventually go. Unfortunately, the effect exactly mimics intermittent relay contacts, and it can drive you nuts.

Truly Micro

Among the smallest switches in use today are DIP switches, so-named because they conform to the Dual Inline Package specs for integrated circuits. Consequently, they look like ICs except that there's a row of switches on top. With the exception of some early CTCSS encoder applications, these switches will be found inside the rig, on the board.

They are intended for set-up parameters, so they don't see lots of switching action. Nonetheless, they occasionally can go bad. Some are slide switches while some are rockers, which are essentially toggle switches. In any case, these things are sealed, and they are just too small to mess with.

You can replace the slide type with a toggle unit, and vice versa, but always check *any* replacement with an ohmmeter, even if it has the same type of switches, to be sure the pinout is the same. Some DIPs may be wired quite differently and some may even have double-throw contacts.

Dits and Dahs

There is one kind of switch we hams are especially familiar with: the Morse code key. Its construction is obvious. Used with electronic keyer circuits and most solid-state rigs, the contacts handle only low power and rarely require more than a little cleaner-soaked paper pulled through them now and then.

Tube rigs (even those whose only tubes are in the driver and final stages), however, can put far more stress on the contacts, because they may be switching as much as 100 volts. If the rig won't key properly, or it sounds lousy on the air, check the key contacts before you dig into the circuitry. A good, low-resistance contact may be essential for proper transmitter operation, and even a few tens of ohms can cause trouble.

Louder, Please

Ah, potentiometers. I often wonder what sadist thought those up! No other kind of control causes as much trouble. Basically, a potentiometer (pot) is just a resistor. To make it variable, a wiper is rubbed across the resistance element. The closer it is to the element's connection, the lower the resistance.

Actually, pots have three connections, with one end of the element being ground and the other being the signal to be sampled. The wiper samples the signal and feeds the next circuit stage. When the pot is not working well, the symptoms can range from the obvious, such as a scratching sound in the audio, to the perplexing, such as an out-of-lock frequency synthesizer, depending upon the pot's intended function.

In fact, when you're faced with a difficult problem, it pays to check any pots or trimpots (small pots meant to be set and forgotten) with a scope to be sure they are not open. *Don't* turn them, though! Once you do, you have no way to set them back to their original positions.

Where's the Rub?

There are two basic kinds of pots: wire-wound and film. Wire-wounds, which have limited resolution (because the wiper can only make contact once per turn of the wire) as well as some inductance, are generally used only when their superior power-handling capabilities are required. The vast majority of pots is of the film variety.

In these units, the resistance element is a carbon-based film which is painted on a nonconductive substrate. The wiper, of course, rubs this film. Because the wiper rubs the resistance element, it is subject to the problem shared by other mechanical connections: poor contact. Unless the pot is being used in some power-handling situation, which is unlikely, the cause of the trouble is almost certainly *not* a burned contact! More likely, the problem is simple wearing away of the resistance element, or dirt or (gasp) cigarette residue clogging the works.

Unless the film is badly worn away, a shot of contact cleaner usually will restore the pot to fine condition. The trick is getting the spray into the pot. Most larger pots, such as volume and squelch controls, have slots near the solder contacts into which you can spray.

After spraying, rapidly twist the pot through its control range to disperse the cleaner and rub away the dirt. Although some smaller pots and trimpots can be sprayed, many are sealed. In that case, you are going to have to get a new part. Also, you'll be faced with the problem of setting it where it belongs. If you match the pointer visually with the old one, you should be close.

Of course, that won't work in the case of multi-turn trimpots, which have only a screw exposed. Unfortunately, you can't read the resistance of the wiper connection because that is what is not working in the first place! In any event, replacement of a trimpot is always going to entail readjustment. Luckily, trimpots rarely fail, because they rarely are moved.

Finally, before you suspect a pot, be sure it really is a pot! On some of the new rigs, the RIT, IF shift, and other controls may be optical encoders. This seems to be a trend in Japanese HF rigs, and it's a welcome one. The encoders are much more reliable than pots ever could be.

Well, I think that about does it for switches and controls. So now, let's turn our attention to a letter.

Dear Kaboom, *I have a Radio Shack HTX-100 mobile rig that I want to use as a base rig. I don't want to use a DC power supply. Is it possible to use a car battery at home, provided I charge it when it runs down? I tried to ask around, but I don't know any hams yet (I'm still studying for my license) and no one else seems to know.*

Signed,
Homin' In

Dear Homin,' Sure, why not? A charged car battery will run your 10-meter rig just fine. I can't imagine, though, why you would not prefer to use a power supply—it would be a lot easier. If you do use a car battery, be sure to properly ground the rig, just as you would if you were using a DC supply. And put a large electrolytic capacitor, say, a few thousand microfarad, in parallel with a 0.1 µf cap across the battery.

Of course, watch the electrolytic's polarity and be sure to use one rated for at least 25 volts. Also, beware of toxic (and possibly explosive) fumes from the battery. These things were never meant to be used indoors, and a spark, soldering iron, or cigarette lighter could set off the hydrogen they produce. The acid fumes can be toxic, too.

Finally, car batteries are not deep-cycle; they are meant for short starting periods followed by immediate recharge. If you run yours way down between charges, it will not live long. If you anticipate such use, get a deep-cycle marine battery, as it will be designed to withstand it. Best of luck and see you on the band!

Dear Kaboom, *My Yaesu FT-208R seems to have amnesia. It works fine, but when I shut it off, all the memories disappear. It's getting to be a pain to re-enter all my local repeaters. Where's my data going?*

Signed,
Forgetful

Dear Forgetful,

To that great databank in the sky, that's where! You have a classic case of "dead lithium battery-itis." '208s are old enough now that the batteries are finally starting to go. It's just a plain-Jane 3-volt lithium cell, but it has solder terminals on it, so you'd better order one from Yaesu, unless you know of a local source (I don't). The battery is located on the microprocessor board, just behind the speaker. You'll have to pull the board, so be careful not to break the wires going to the keypad. And naturally, be sure to get the polarity right—micros don't appreciate reversed voltage!

And see you all next month. 73

HOMING IN

Radio Direction Finding

Joe Moell PE K0OV
PO Box 2508
Fullerton CA 92633

RDF Fights RFI

Even if you don't enjoy competitive transmitter hunting or search/rescue work, you will probably need to go DFing at some point. Most likely, your target will be some sort of non-ham RF interference (RFI).

Over the years, I have searched for dozens of noise sources, from aquarium heaters to gas oven thermostats. One of my most interesting (and frustrating) RFI adventures took place about two years ago in Stanton, California.

This story is true, but I'll leave out actual names, calls, and addresses. The victim (we'll call him W6XYZ) loved rag-chewing and daily nets on 75 meters. One day, a strange signal began to crowd him out. It was a very unstable carrier, moving up and down the band and occasionally disappearing. Most of the time, the signal was 20 dB over S9 and right on top of his favorite net frequency near 3900 kHz. By the time I got involved, W6XYZ's block had been checked out by the power and cable TV companies, who could not find the source of the signal in their lines.

Looking For Harmonics

The first rule of RFI-busting is to search on the highest practical frequency. At 80 and 40 meters, long power lines and other objects reradiate signals and distort RDF measurements. Null-type antennas are the norm. At VHF, gain antennas are practical, and long radiators are less common.

I set up a general coverage receiver and calibrated RF attenuator in W6XYZ's shack and tuned from 150 kHz up, making a chart of all RFI carriers by frequency and relative amplitude. There were a lot of them, but they all sounded different. The strongest (20 dB above the 3900 kHz spur) was at 3400 kHz.

Harmonics at varying levels (11 to 33 dB down) were present every 3400 kHz all the way up to 30 MHz, the top of the receiver range. I figured that the 15th harmonic at 51.05 MHz should be strong enough to detect. If so, my 6 meter T-hunt "Shrunken Quad" (see "Homing In" for January 1990) could DF the source.

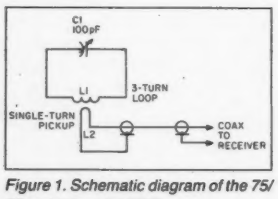


Figure 1. Schematic diagram of the 75/80 meter loop for RDF.

A few days later, my wife April and I were back with the van set up for 6 meter hunting. The 51 MHz harmonic dropped off rapidly as we drove away from W6XYZ's home. All the bearings pointed right back to his house. Using a Yaesu FT-690R and its whip, we sniffed around the house and found the source of the 51 MHz harmonic. It was the solar heating control unit in W6XYZ's own closet!

Gleefully, we turned off the controller and ran to the shack to check the HF bands. Sure enough, the noise at 3400 and its harmonics had stopped. In fact, the spectrum was very quiet—all except the signal at 3900 kHz. It was as strong as ever. Rats!

Building a Loop

So, the direction finding had to be done on 75 meters. We didn't have the time or the motivation to do anything fancy. All we needed was an indication of which way to go. A loop antenna was the clear choice.

The receiving loop (L1 in Figure 1) is three turns of #18 AWG solid enameled wire, resonated with a 100 pF air variable capacitor (C1). Signal snagged by this outer loop couples to the coax via single-turn inner loop L2. Inductive coupling works much better than direct coax connection to the outer loop, which would upset the balance and cause poor nulls.

Photo A shows the completed antenna on the T-hunt van. The frame is Class 125 (thin wall) PVC pipe, 3/4-inch trade size. That matches with my standard mast system for hunting on other bands (see "Homing In" for July 1989). Note that the coax bows slightly so it does not touch the bottom of L1.

To build this loop, cut the top and side PVC frame members and assemble them into a slip-type PVC cross-fitting. Bond them with PVC pipe glue. Use a 5/64-inch drill bit to make individual holes through the mast and cross pieces for the three large loop wires. Space the turns of the large loop about 3/16 inch apart. Holes for the large loop wires are 16 inches from the center of the cross, and holes for the inner pickup loop are eight inches out.

Tuning the antenna is easy—just connect it to the receiver and peak the background noise on the hunt frequency by adjusting C1 with an insulated tool. Keep yourself and any objects clear of the loop during tuning.

Check out your loop on a local (ground wave) signal before going RFI-hunting. The pattern of small (less than 0.08 wavelength) loops like this has two broad peaks (in the plane of the loop) and two sharp nulls (looking through the loop). The nulls are easiest to use and most accurate for RDF.

The ambiguous nulls 180 degrees apart would cause problems in a long distance T-hunt, but not in a neighborhood RFI search. Just take several

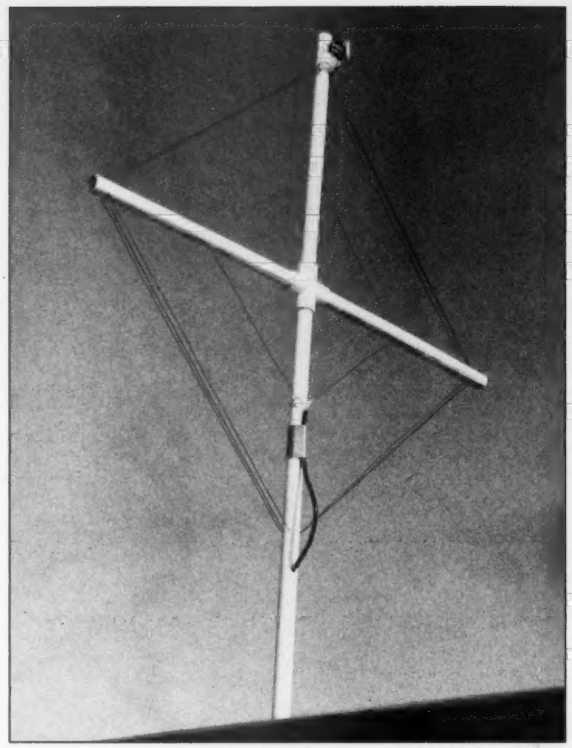


Photo A. Not fancy, but functional, this simple loop on a PVC pipe frame will ferret out interference sources on 75/80 meters.

"fixes" from well-spaced locations around the area and plot the lines of bearing on a map. They should intersect near the interference source. Follow the bearing lines and home in.

If necessary, you can resolve the 180-degree ambiguity by using the directivity of a mobile whip on your vehicle. Typical 75-meter whip systems show higher S-meter readings in the direction of the greatest amount of ground plane. For example, if your whip is on the left rear bumper, it will give a slight amount of enhancement to signals coming from the right front.

Be sure to remove your 75-meter whip from the car while DFing with the loop. The proximity of a resonant whip causes inaccurate loop nulls. Similarly, avoid taking bearings when directly under power lines, etc.

If you expect to hunt very strong signals and your receiver does not have a wide range RF gain control, connect an RF attenuator between the antenna and the receiver. Do not transmit into the loop or attenuator. Unplug the mike and key to prevent accidents.

The loop will not give good nulls close-in if a long power line or the wiring of a house radiates the RFI. For example, let's say you are 200 feet away from the center of a radiating overhead power line 400 feet long. The difference in azimuth from the left end to the right end of the line is 90 degrees.

When you attempt to null the left end, the right end lies in the peak of the loop response. No matter which way you turn the loop in this case, there will be some signal to "fill" the null in the pattern. So, when you get too close to get good nulls, switch from the loop to a whip and move around, looking for the highest S-meter readings.

Closing In

A few days later, we went off to Stanton to snoop around with the loop. RDF bearings and S-meter readings showed the hottest area to be about two blocks away from W6XYZ in a cul-de-sac. The curbside signal was strongest in front of House A, and almost as strong in front of House B. Both were fed from one overhead power line in the rear.

House A's owner was not at home, so we rang the bell at House B. When I explained the problem, the family was very receptive and let me probe the back yard with a Sony ICF-7600 portable shortwave set. The power drop to the house and the breaker box were radiating plenty of 75 meter RF.

We found no obvious "hot spots" inside or outside. I asked if I could turn

Sources For C1

Surplus Sales of Nebraska
1315 Jones St.
Omaha NE 68102
(402) 346–4750
Part number: TRIM-1010

Ocean State Electronics
PO Box 1458
Westerly RI 02891
(401) 596–3080
(800) 866–6626
Part numbers: 148-6 or APC-100-C

off the House B main breaker for a minute. They consented, I flipped the breaker, and the noise continued in the portable receiver.

By now, the owner of House A was home, but he was not interested in W6XYZ's plight. "Hams cause all the TV interference problems," he said, "so I don't care if I cause a problem for a ham."

I told him I just wanted to check the incoming power line in his back yard.

"Come back with the Edison Company," he replied, and asked us to leave.

When I told W6XYZ about our experience, he began to despair. He said that he was thinking of selling his house and taking a long trip in his RV. I wasn't ready to give up yet.

To be absolutely sure that House A was the culprit, I did a "porch light survey," reading the signal strength of the 3900 KHz radiation from the front porch light wiring of every house in the neighborhood on the Sony receiver. Sure enough, the light at House A radiated 20 dB more signal than any other.

I tried one more time at the door of House A, this time with W6XYZ along.

Despite our best efforts at diplomacy, the owner would not let us into his house or yard, nor would he turn off any breakers for tests.

FCC Gets Involved

I gathered all the RDF and porch light data. Then I put together some maps of the neighborhood, showing how House A was clearly the RFI source. I wrote a cover letter to the engineer-in-charge of the Los Angeles area FCC office, detailing the problem. I pointed out that the 3900 KHz radiation from House A was so great as to be a violation of FCC Part 15, that the owner was uncooperative, and that FCC intervention was needed.

Less than two weeks after I sent the letter and data, the FCC sent a letter by certified mail to the owner of House A, telling him that he was in violation of Part 15 and had 15 days to correct the problem.

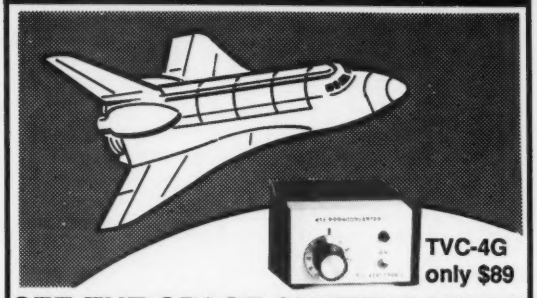
Apparently, that really lit his fuse. I heard that he promptly drove to the FCC office and railed against W6XYZ and me. Fortunately, the FCC stood firm.

From that point on, my information is secondhand. I heard that circuit breaker checks showed the QRM definitely came from House A, and that a bad power line ground and loose cable TV hardware were found and fixed. But the 3900 kHz radiation continued.

Two months later, I heard that an FCC engineer had located the RFI source in the house, and ordered it to be repaired. But by that time, W6XYZ had sold his house and was moving out.

Apparently, the malfunctioning device never got fixed. I drove down W6XYZ's old street last week, and heard an unstable carrier on 3900 kHz. If you like 75 meters and are thinking of buying a home in Stanton, call me first. 73

AMATEUR TELEVISION



TVC-4G only $89

SEE THE SPACE SHUTTLE VIDEO

Many ATV repeaters and individuals are retransmitting Space Shuttle Video & Audio from their TVRO's tuned to Satcom F2-R transponder 13. If it is being done in your area on 70 CM, all you need is one of our TVC-4G ATV 420-450 MHz downconveters, add any TV set to ch 3 and 70 CM antenna. Others may be retransmitting weather radar during significant storms. Once you get bitten by the ATV bug - and you will after seeing your first picture - show your shack with the TX70-1A companion ATV transmitter for only $279. It enables you to send back video from your camcorder, VCR or TV camera. ATV repeaters are springing up all over - check page 411 in the 90-91 ARRL Repeater Directory. Call for a copy of our complete 70, 33 & 23 CM ATV catalog.

(818) 447-4565 m-f 8am-5:30pm pst. Visa, MC, COD
P.C. ELECTRONICS Tom (W6ORG) Maryann (WB6YSS)
2522 S. Paxson Ln Arcadia CA 91007

AMATEUR RADIO EQUIPMENT

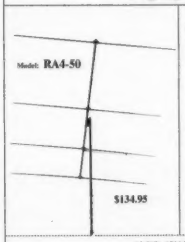
CALL CompPute Inc. 800-942-8873 For Your Best Price

Authorized dealer for Icom, Kenwood, Yaesu, ASTRON, Belden, Bencher, AEA, Cushcraft, MFJ, RF Concepts, Hustler, Kantronics, Wilson, Diamond, Ham-10, Larsen, Wm. M. Nye, B&W, ARRL, Ameritron, Epson, Farr Corner, DTK

1057 East 2100 South, Salt Lake City, UT 84106
801-467-8873

CIRCLE 156 ON READER SERVICE CARD

Presenting
The Finest 50 MHz Yagi Available!
Model: RA4-50
Design by K3IPW



ELECTRICAL SPECIFICATIONS:
Measured gain ..... 8.25 dBd
E-Plane beamwidth ..... 51 deg
H-Plane beamwidth ..... 65 deg
Bandwidth ..... 1 MHz
SWR ..... 1.03:1 typical
F/B ratio ..... 30 dB
Maximum Power ..... 400 Watts
Impedance ..... 50 ohm

MECHANICAL SPECIFICATIONS:
Length ..... 12ft. 4in.
Boom .. 1.25"OD 6061 T-6 Aluminum
Elements ..... 1/2" Al tubing
Element mounts . Extruded Aluminum
Wind survival ..... 120+MPH
Mast ..... up to 2" diameter
All Stainless Steel Element Hardware
Coax connector .... Waterproof N-type
Weight ..... 10.5 lb

ALSO AVAILABLE
RA4-50, RA7-50, RA8-2UWB, FO12-144, FO15-144, FO16-220, FO22-432, FO22-ATV, FO25-432, FO33-432, FO11-440
POWER DIVIDERS ..... STACKING FRAMES

We supply those hard to find parts for the home builder
Add $5 UPS $/H for each antenna
$7 west of the Mississippi
PA residents add 6% state sales tax.

RUTLAND ARRAYS
1703 Warren St. * New Cumberland, PA 17070
(717) 774-5298 7-10 pm EST
DEALER INQUIRIES ARE INVITED
CALL OR WRITE FOR OUR NEW CATALOG!

CIRCLE 71 ON READER SERVICE CARD

ICOM™ R7000 Sweeping 1300 Channels/Min.

DELTACOMM™ 1.04 gives you a custom interface and optimized software that will not just control but will maximize the potential of your R7000. Spectrum log at speeds in excess of 1300 channels/min. while automatically generating a histogram of frequency/activity. Advanced priority channel monitoring and program control, by channel, of remote tape recorders during scanning. Here are a few (there are many more) examples of the advanced features DELTACOMM has to offer:

- Birdie log during frequency search automatically characterizes your R7000, then locks out those frequencies.
- Auto histogram and scan file creation during spectrum log.
- Scan file channel lock-out feature allows scanning around channels without removing that frequency from database.
- Resume scan and maximum monitor values unique on each channel scanned.
- Each frequency within a scan file has an area (40 characters wide) for channel information.

- Auto frequency detection and storage during search and spectrum log.
- User friendly installation program reduces need for DOS knowledge.
- Full support of serial ports COM1-COM4.
- On-screen HELP reduces need to refer to user manual.
- REQUIREMENTS: MS-DOS microcomputer with minimum 512K memory. DELTACOMM's performance is proportional to baud rate setting, style of display card and type of computer used.

$299 Incl. Ext. Interface & Components for Cabling
Check, MO, VISA or MASTER Accepted - $4 for S&H
(WI Res. Add 5% Sales Tax)

DELTA RESEARCH
PO Box 13677 • Wauwatosa, WI 53213
FAX or Phone Weekdays (414) 353-4567

CIRCLE 256 ON READER SERVICE CARD

MAXCOM®
AUTOMATIC ANTENNA MATCHER
The ultimate advanced technology — when you need it most.

P.O. Box 502
Ft. Lauderdale, FL 33302 Call Sonny
(305) 523-6369
THE BOTTOM LINE: "MAXCOM WORKS"

CIRCLE 101 ON READER SERVICE CARD

ATV

Ham Television

Bill Brown WB8ELK
%73 Magazine
Forest Road
Hancock NH 03449

Simulated ATV Satellites

Students at Franklin Community High School (Franklin, Indiana) have a very exciting course offering. Each year juniors and seniors have the opportunity to take an Aerospace Technology Class (wish I had one of these when I was in school!). One particularly fascinating part of the course is the satellite simulation experiment. They get to design, build and test their own satellite.

This year, they decided to design a weather observation satellite. Since launch opportunities are limited, they elected to send their satellite to the edge of space using a weather balloon. To study cloud patterns, they incorporated a live TV camera and ATV transmitter so they could receive live images directly in their classroom mission control center. In addition, they designed two different radar reflectors to test their visibility on FAA radar screens.

Using components donated by Bob McAuliffe W9PRD from one of his pioneering ATV balloon experiments (June 1988), and with guidance from Chuck Crist WB9IHS and teacher Doug Craig, the students designed the satellite payload for maximum stability. They even performed wind tunnel tests and drop tests of the parachute recovery system. A series of classes were held to discuss the theory behind the system, go over the design goals, and then proceed to build the payload.

The payload consisted of a Wyman Research ATV transmitter, a Uniden VM-110 TV camera, a 2m FM transmitter with CW ID and a 10 meter CW beacon. Callsigns on the payload were: ATV—WB9IHS, 2m—W9PRD, and 10m—WB8ELK.

The components were mounted in a hexagonal styrofoam package with a swivel mounted on top. This aerodynamic design helped maintain a very stable camera platform for excellent ground imaging. One nice touch that I particularly enjoyed was the TV camera lens protector—half of a pair of sunglasses!

Liftoff

After thoroughly testing their satellite, the class was ready to fly. After a couple of weather delays, they were finally able to launch their balloon satellite at 1:15 p.m. EST on April 21. The students gathered around their ATV receive station and had a blast riding along with their balloon as it provided them with spectacular aerial views of their school as it was rapidly left behind.

The package disappeared into the clouds and nothing could be seen for awhile from the video camera. Soon the balloon system was above the clouds and they could observe the cloud tops from an ever increasing altitude. They now had a functioning weather satellite!

Quite a few area amateurs pitched in to help make this a successful event. Ron Pogue KD9QB and pilot Ken Jessup actually circled over the launchsite in a small plane and transmitted the takeoff through the Indianapolis ATV repeater. Dozens of midwestern hams checked into the tracking net (operated by Emmett K9YKX) with direction reports throughout the 2 hour flight. Excellent video (although of cloud tops) was reported over a several state area. Although the 2m beacon died at about 12,000 feet, it was heard as far away as Wisconsin!

Success!

The Indianapolis foxhunt group also provided their headings as they drove along under the payload. The students took these beam headings and plotted them on a large map of Indiana. They learned a lot about direction finding and were quite accurate in locating the package during its journey. After reaching 95,000 feet, their weather satellite could see a large area of Indiana below. At this point the balloon burst and the package parachuted back to Earth. Their map plots were so accurate that the chase plane was able to actually see the package as it was parachuting down and watch it land in an open field near a small road. The package had drifted just over 28 miles to the southeast to land near the towns of Westport and Alert.

The Indianapolis foxhunters were so close that they could see the circling plane. Larry Oaks WB9YAJ and Paul Bohrer W9DUU (two veteran balloon trackers) arrived at the scene just a few minutes after it landed.

The radar reflector experiment was successful. They actually flew *two* balloons. One of the reflectors (The Pizza Hut design—named for the sign it was designed around) flew on the main payload. The other reflector (a very large garbage can design) flew on a small, very slow-rising balloon that was launched at the same time as the weather satellite balloon. Both reflectors were made out of metallized Mylar. Controllers at the Indianapolis FAA center successfully tracked both balloons during their flights. Although there was no radio beacon on the small balloon, the controllers followed it almost to the Kentucky border. It was later found and returned!

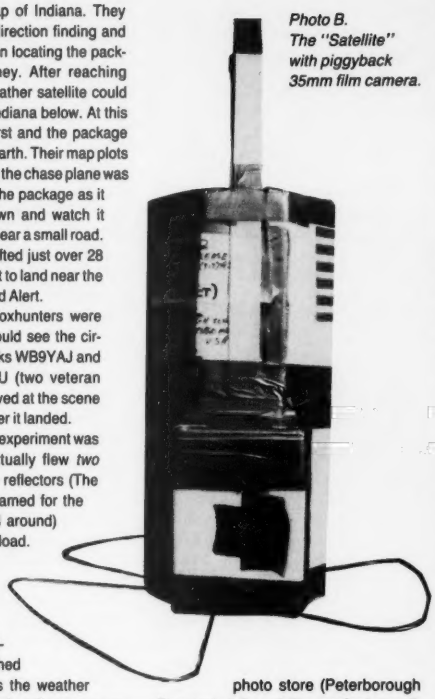


Photo B. The "Satellite" with piggyback 35mm film camera.

Photographs from the Edge of Space

In addition to the live video experiment, I sent the students a 35mm film camera to attach to the side of their satellite. Even though the temperatures could drop down below –60 degrees, I hoped the camera would survive to take some really spectacular high definition color photos.

After browsing through the local photo store (Peterborough Camera), I found the perfect candidate, the Samsung AF-SLIM. This little gem is a full-featured pocket camera with a built-in autowinder and timer (30s, 60s or 10m). Another nice feature was a lens system that would pop out of its lens cover to take a picture and safely retract back into its protective cover (ideal for the harsh environment in the stratosphere!).

The class programmed the camera to take a photograph every 10 minutes during the flight. Since the balloon ascended at about 1000 feet per minute, they snatched a photo every 10,000 feet.

The results? Let me put it this way: When the photoprocessor in Indiana handed the photos back to Chuck

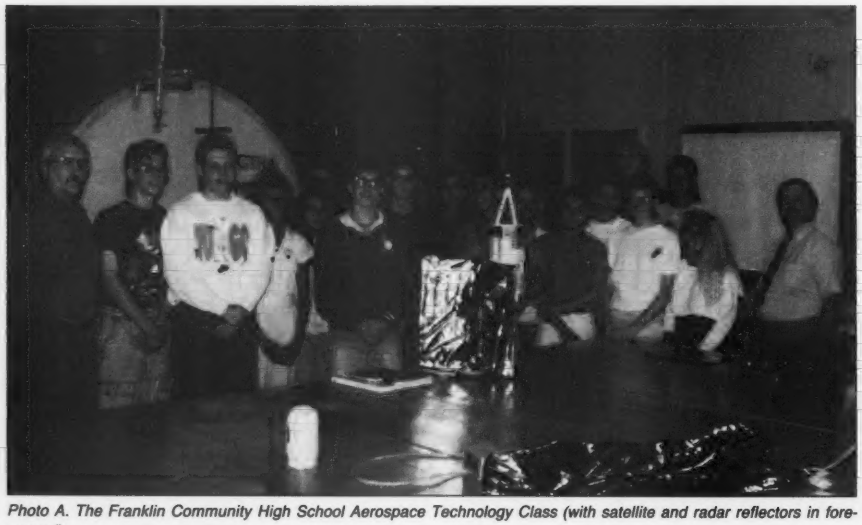


Photo A. The Franklin Community High School Aerospace Technology Class (with satellite and radar reflectors in foreground).

Photo C. The automatic camera takes a surprise picture of balloon tracker Paul W9DUU shortly after landing.

Photo D. The Samsung AF-SLIM pocket camera can take the rigors of the stratosphere!

Photo E. 45,000 feet over Indiana.

Photo F. Stratospheric views from 75,000 feet (visibility over 350 miles). The blue layer is the Earth's atmosphere.

Photo G. The top altitude of 95,000 feet. The atmosphere is just a thin blue haze from this vantage point at the very edge of space!

WB9IHS, he said, "How'd you take these pictures? From a spacecraft?" "*. . . Well, as a matter of fact . . .*". See photos E through G for the spectacular results. Photo E was taken at 45,000 feet, Photo F at 75,000 feet and Photo G at the top altitude of 95,000 feet.

The Next Step?

The Aerospace class plans another experiment this October. This time they will design a communications satellite. At least a dozen schools across the midwest plan to use this balloon satellite to communicate with each other via a cross-band FM repeater system. The cross-band repeater will be unique in that the audio uplink to the satellite will be on 2 meters, but the downlink will be on both the sound subcarrier and on-carrier of an ATV transmitter (with live TV camera). That way, even if one of the schools doesn't have an ATV receive setup, they can tune in to the ATV center carrier on an FM receiver. 73

RANDOM OUTPUT

David Cassidy N1GPH

Cleveland Calling

She said she lived in the Cleveland area. She called the *73* offices to ask a few questions, offer a few suggestions and just to chat about amateur radio. (You'd be surprised at how many calls I get in a week from people who just want to talk about radio. They hardly ever ask for me by name, but Rose at the switchboard puts them through to me when she can't figure out who else to forward their calls to.)

We talked for a while, and I got to know a little about her. Her story is quite typical: a 1x3 callsign, licensed for almost 30 years, inactive for most of those 30 years (though always renewing the license), recently getting back into the radio hobby. She was stymied by the incredible changes in the last fifteen-or-so years. Shirt pocket-sized HTs, HF rigs costing a third of your annual salary that do everything but print the QSL card and lick the stamp, Novice voice privileges, the WARC bands, packet—all brand new to her. So many changes. So many things to catch up on.

She told me she had even lost her head and, in a fit of high tech euphoria, actually gone out and bought herself a computer.

She was easy to talk to. As good a listener as she was a talker, I found the conversation lengthening effortlessly to 10, 15, 20 minutes—sort of like those nice QSOs you have every once in a while when you actually feel you've gotten to know someone and maybe even made a new friend.

"Do you want to know the biggest change I've noticed?" she asked, as we got ready to say our goodbyes. "I can't believe the foul language and just plain rudeness you hear on the bands now. Don't these hams realize that there are people all over the world listening to them? Why isn't the FCC doing something about this?"

I explained that the FCC simply doesn't have the budget, staff or interest in acting as amateur radio's hall monitor. I told her that since amateur radio was supposed to be self-policing, it was up to her and me—and all licensed amateurs—to regulate ourselves.

There was a long silence, and I could feel the mood of the conversation turn, not to anger or self-righteous indignation, but to sadness. She and I, both of us licensed since our early teens, sharing a melancholy recollection of how things used to be.

"Do you remember when people were courteous to each other on the ham bands?" she asked.

I said yes.

"Do you remember when people actually talked to each other and got to know each other, instead of all this 'you're 5 and 9, thanks for the QSO' business?"

"Yes."

"Do you remember when you never EVER heard foul language or dirty jokes on the bands?"

"Yes, it wasn't all that long ago."

"So . . . what happened?"

The pleading in her voice indicated that this wasn't a rhetorical question. She really wanted an answer. I didn't have one for her.

"Couldn't you write something about this? You could ask people to clean up their acts. Write articles about how average hams could help clean up the bands."

I told her to go back over the last twelve issues and read Wayne's columns. He's addressed these issues over and over again.

"Don't you understand the power you have?" she asked. "Don't you understand that the ham magazines could get together and really help make amateur radio better by pointing out some of these problems?"

She became more and more insistant—more and more desperate. The conversation continued along the same lines for many minutes. The more she asked "why," the worse I felt for not being able to give her a satisfactory answer. I didn't know what to tell her, except that at least we could set a good example for newcomers by our own courteous practices. She told me she did indeed make a point of scanning the Novice portion of 10 meters and answering those young voices calling "CQ." I thanked her for that, and told her to keep it up.

The conversation was over. I could tell we both hung up with a sour feeling in our hearts: Hers for not getting the answers she was searching for, mine for not being able to provide those answers.

I sat at my desk, staring at my phone and thinking about what she had said. She had told me I had "power." She had used the old pen being mightier than the sword cliche and asked me—pleaded with me—to do something to change people's attitudes. We had both remembered when the ham bands were an island of courtesy in a brusque and brash world. She had hoped I could tell her how to return to this time. I could not. I do not have the "power" she thinks I have. Neither does Alan Dorhoffer . . . nor Dave Sumner . . . nor Wayne Green himself.

How can we get people to remember that if we do not clean up our own messes, pretty soon we will all be living in the same garbage pit?

Do any of you have an answer? There's a woman in Cleveland who needs to know. 73

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 E. Chateau Circle
Payson AZ 85541

Winding Down

As I write (around the end of April), we have seen the solar flux dive from a 300+ value to a 130+ value in less than a month! Yes, Cycle 22 is on its way down. In August you can expect some good conditions and some fair-to-poor conditions as we move from summer to autumn. See the calendar below.

The poorest days for DX on the HF bands will be approximately the 5th–8th; the 16th–21st; and the 24th–27th. Otherwise, you may expect decent worldwide conditions—unless, of course, we get some unexpected solar flares in between these dates!

Ordinarily, the flares occur near or on the dates given as poor, so don't be too concerned about the other days . . . but be aware that Old Sol is often unpredictable.

The HF bands from 10 through 20 meters will be open on many days until well after local dark, and during the day you can expect everything from short skip to long skip. Long path DXing can take place in the early morning hours just after sunrise, and occasionally just after dark.

Use the band-time-country chart to plan your operating on the HF bands, and use the daily forecast to pick the best days for your efforts.

I've noticed plenty of times that stations will make futile calls for DX at times, and on days, when there is no hope of raising anyone! Perhaps that is because these operators are totally unaware of the forecasts or the reasons behind them. Don't try harder—just smarter! See you next month, and meanwhile, for the most up-to-date conditions in the ionosphere, listen to WWV at 18 minutes after any hour. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	—	—	—	—	20	20	—	—	—	—	15(17) 12
ARGENTINA	15(17) 12	15(17) 12	20	20	—	—	—	—	—	15 12	15(17) 12	15 12
AUSTRALIA	15(17) 12	15(17) 12	—	20	20	—	28(30) 16	20	—	—	—	—
CANAL ZONE	20	20	20	20	20	20	20	15(17) 12	15(17) 12	15(17) 12	15(17) 12	15(17) 12
ENGLAND	20	20	28 16	—	—	—	15(17) 12	15(17) 12	—	15(17) 12	15(17) 12	20
HAWAII	15(17) 12	15(17) 12	20	20	20	20	20	—	—	—	—	15 12
INDIA	20(17) 12	20(17) 12	—	20(17) 12	20(17) 12	—	—	—	—	—	—	15(17) 12
JAPAN	—	—	—	—	—	20	20	—	—	—	—	15(17) 12
MEXICO	20	20	20	20	20	20	20	15(17) 12	15(17) 12	15(17) 12	15 12	15(17) 12
PHILIPPINES	—	—	20	—	—	20(17) 12	20(17) 12	15(17) 12	15(17) 12	—	—	—
PUERTO RICO	20	20	20	20	20	20	20	15(17) 12	15(17) 12	15(17) 12	15 12	15(17) 12
SOUTH AFRICA	—	40(17) 30	20	20	20	—	—	15(17) 12	15(17) 12	20	—	—
U.S.S.R.	20	28 16	28 16	—	—	—	—	—	—	15(17) 12	15(17) 12	20
WEST COAST	15(17) 12	15(17) 12	28(30) 16	28 16	40	40	40	—	20	15(17) 12	15(17) 12	15(17) 12

CENTRAL UNITED STATES TO:

ALASKA	15(17) 12	—	—	—	—	20	20	20	—	—	—	15(17) 12
ARGENTINA	15(17) 12	15(17) 12	20	—	—	20(17)	—	—	—	—	15 12	15 12
AUSTRALIA	15(17) 12	15(17) 12	—	20	20	—	20	—	—	—	15(17) 12	15(17) 12
CANAL ZONE	15(17) 12	20	20	20	—	20	20	15(17) 12	15(17) 12	15(17) 12	15(17) 12	15 12
ENGLAND	20	20	—	—	—	20(17)	—	—	—	—	15(17) 12	15(17) 12
HAWAII	—	—	20	20	28 16	—	20	—	15(17) 12	15(17) 12	15(17) 12	15(17) 12
INDIA	15(17) 12	20(17)	—	—	—	20(17)	20(17)	—	—	—	—	15(17) 12
JAPAN	15(17) 12	—	—	—	—	20	20	20	—	—	—	15(17) 12
MEXICO	15(17) 12	20	20	20	—	20	20	15(17) 12	15(17) 12	15(17) 12	15(17) 12	15 12
PHILIPPINES	15(17) 12	—	20(17)	—	—	—	20(17)	20(17)	—	—	—	—
PUERTO RICO	15(17) 12	20	20	20	—	20	20	20	15(17) 12	15(17) 12	15 12	15 12
SOUTH AFRICA	—	—	28 16	20(17)	—	—	—	15(17) 12	15(17) 12	20(17)	—	—
U.S.S.R.	20	20	20	20	—	20(17)	—	—	15(17) 12	15(17) 12	15(17) 12	20

WESTERN UNITED STATES TO:

ALASKA	15(17) 12	20	20	20	20	20	—	20	15(17) 12	15(17) 12	15(17) 12	15(17) 12
ARGENTINA	15 12	15(17) 12	15(17) 12	20	20	—	—	—	—	—	15 12	15 12
AUSTRALIA	15(17) 12	15(17) 12	15(17) 12	20	20	28 16	28 16	20	—	—	—	15(17) 12
CANAL ZONE	15(17) 12	15(17) 12	20	20	20	—	—	—	—	—	15(17) 12	15(17) 12
ENGLAND	20	20	20	20	—	20(17)	—	15(17) 12	15(17) 12	—	—	20
HAWAII	15 12	15(17) 12	20	20	40	40	20	20	—	15(17) 12	15(17) 12	15 12
INDIA	—	15(17) 12	15(17) 12	—	—	—	20(17)	20(17)	15(17) 12	15(17) 12	—	—
JAPAN	15(17) 12	20	20	20	20	20	—	20	15(17) 12	15(17) 12	15(17) 12	15(17) 12
MEXICO	15(17) 12	15(17) 12	20	20	20	—	—	—	15(17) 12	15(17) 12	15(17) 12	15(17) 12
PHILIPPINES	—	15(17) 12	15(17) 12	—	—	20	20	20	15(17) 12	—	—	—
PUERTO RICO	15(17) 12	15(17) 12	20	20	20	—	—	—	15(17) 12	15(17) 12	15(17) 12	15(17) 12
SOUTH AFRICA	—	—	—	20(17)	—	—	—	20(17)	15(17) 12	15(17) 12	—	—
U.S.S.R.	20	20(17)	20(17)	20(17)	—	—	—	—	—	—	—	20
EAST COAST	15(17) 12	15(17) 12	28 16	28 16	40	40	40	—	20	15(17) 12	15(17) 12	15(17) 12

Notes: (1) Possible but rare dual bands (10 or 12, 15 or 17, 20 or 40). Try where shown. The highest possible bands shown. Also try next lower band at times shown.

AUGUST 1991

SUN	MON	TUE	WED	THU	FRI	SAT
				1 G	2 G	3 G
4 G–F	5 F–P	6 F–P	7 P	8 P–F	9 F–G	10 G
11 G	12 G	13 G	14 G–F	15 F	16 F–P	17 P
18 P	19 P	20 P	21 P–F	22 F	23 F	24 F–P
25 P	26 P	27 P–F	28 F–G	29 G	30 G	31 G

CABLE TV CONVERTERS

Why Pay A High Monthly Fee?
Save $100's A Year

- All Jerrold, Oak, Hamlin, Zenith, Scientific Atlanta, and more.
- 60 Day Money Back Guarantee
- Shipment within 24 hours
- Visa/MC and C.O.D.

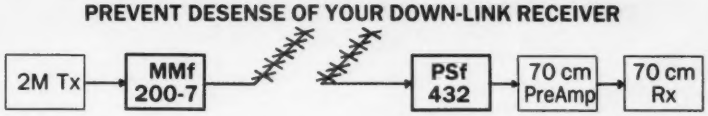
WE WILL BEAT ANYONE'S PRICE
No Illinois Orders Accepted
Purchaser agrees to comply with all state and federal laws regarding private ownership of cable TV equipment. Consult local cable operator.

Electronic Engineering
P.O. Box 337, Barrington, IL 60011
FOR ORDERS ONLY
1-800-542-9425
INFORMATION
1-708-540-1106

CIRCLE 185 ON READER SERVICE CARD

OSCAR MODE-J FILTERS

PREVENT DESENSE OF YOUR DOWN-LINK RECEIVER



MMf200-7 (usually sufficient)	$55.00	PSf432 (for extra protection)	$105
I.L. @ 145 MHz	0.5dB	I.L. @ 435 MHz	0.1 dB
Loss @ 435 MHz	40 dB min	Loss @ 145 MHz	70 dB typ

Send 75¢ (3 stamps) for detailed specs on all VHF & UHF products. Shipping FOB Concord, MA
PRICES SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

SPECTRUM INTERNATIONAL, INC. (508) 263-2145
P.O. Box 1084, Dept. S, Concord, MA 01742, USA

CIRCLE 183 ON READER SERVICE CARD

Factory Authorized Dealer & Service For
KENWOOD
YAESU
ICOM

Call Us For
Great Prices & Great Service

TOLL FREE ORDER LINE 1-800-344-3144
Continental U.S. & Texas

ICOMM, INC. — SAN ANTONIO TEXAS
THE HAM CENTER
SALES AMATEUR RADIO SERVICE
5730 Mobud San Antonio, TX 78238 (512) 680-6110
FAX (512) 647-8007

NEW ONLINE CALL DIRECTORY

Our new *HAMCALL* service gives you 494,114+ Hams, via your computer. $29.95 per year — unlimited use!

BUCKMASTER PUBLISHING
Mineral, Virginia 23117
703: 894-5777 800: 282-5628

CIRCLE 170 ON READER SERVICE CARD

Silent Solar Power

The $319.95 Bullet-Tested QRV Solar Power Supply keeps your repeater on the air 'round the clock or powers your 100w HF station 60 hrs a month. Control circuit speeds charge, protects gel cells & sealed batteries. Fully assembled, QRV, portable. Easily expanded.
Add $10 S&H Info $1
AntennasWest
(801)373-8425 Box 50062 Provo UT 84605

CIRCLE 236 ON READER SERVICE CARD

Ace Systems

OPTO Iambic Keyer

• Ultra compact 5" x 5¼" x 1½" • OPTO isolated output • Battery or DC powered • Full function Iambic Keyer • Adjustable speed and weight • One Year Ace Systems Warranty

- See Your Ace Dealer -
- **Amateur Electronics Supply**
- **Barry Electronics**
- **KJI Electronics**
- **Madison Electronics**
- **Oklahoma Comm. Center**
- **R. F. Enterprises**
- **R & L Electronics**
- **Rivendell Electronics**

Ace Systems • RD 1 • Box 83 • Wilcox, PA 15870
(814) 965-5937

CIRCLE 83 ON READER SERVICE CARD

"Know Who's Calling!"

The Call Identifier has the Answer

- **displays callers phone number when your phone rings**
- **stores phone numbers with date and time of call**

$79.95 plus check/money order

SURVEILLANCE-COUNTERSURVEILLANCE EQUIPMENT CATALOG...$5.00

EDE P.O. Box 337, Buffalo, NY 14226
(716) 691-3476

Dealer Inquiries Invited
Check with your local Phone Company for CALLER ID service availability

CIRCLE 294 ON READER SERVICE CARD

Used Commercial Gear

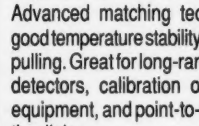
45 Watt, 132-150 MHz Micor	$79
40 Watt, 132-150 MHz Exec II	$79
• • • Packet Special • • •	
30 Watt VHF GE Century II	$99
20 Watt UHF GE Century II	$119

Repeaters, DTMF Mics, MORE!!

Versatel Communications
1-800-456-5548
P.O. Box 4012 • Casper, Wyoming 82604

CIRCLE 259 ON READER SERVICE CARD

X-BAND TRANSMITTER



Miniature (2¼ x 3¾ x 1") GaAs microstrip transmitter provides 10 dBm centered at 10.525 GHz. Integrated microstrip patch antenna eliminates the need for an external antenna. Advanced matching techniques secured good temperature stability with low frequency pulling. Great for long-range testing of radar detectors, calibration of radar receiving equipment, and point-to-point communication links.

Complete Assembled System **$39.00**
Parts & Instruction Kit **$29.00**
Plus $2.00 Shipping and Handling

INNOTEK Inc.
P.O. Box 80096, Fort Wayne, IN 46898
(219) 489-1711

Visa • MasterCard • Check • Money Order • COD
Money-Back Guarantee

CIRCLE 293 ON READER SERVICE CARD

VISA MasterCard **ICOM** AMERICOM ELECTRONICS

VHF COMMUNICATIONS

280 Tiffany Avenue
Jamestown, New York 14701

9:00 am - 5:30 pm weekdays
Weekends and evenings by appointment.

Western New York's finest ... amateur radio dealer!
PH. (716) 664-6345
(800) 752-8813 for orders only

Wayne's Pix

22C33 **How to Work the Competition into the Ground & Have Fun Doing It** *by John T. Molley* America's top consultant reveals his proven techniques for dramatically increasing how much work you do . . . in half the time! **$9.95**

20N098 **Electromagnetic Man** *by Cyril W. Smith & Simon Best* examines the mounting evidence of harmful biological effects from LF electromagnetic fields. Full of utterly fascinating material in many areas. **$29.95**

REFERENCE

20N101 **Everyday Electronics Data Book** *by Mike Tooley BA.* Information is presented in the form of a basic electronic recipe book with numerous examples showing how theory can be put into practice using a range of commonly available 'industry standard' components and devices. 256 pp. 134 line drawings. **$18.00**

20N102 **Practical Digital Electronics Handbook** *by Mike Tooley* contains nine digital test gear projects, CMOS, and TTL pinouts and tables or reference data. Introduces digital circuits, logic gates, bistables and timers, microprocessors, memory and input/output devices, before looking at the RS-232C interface and the IEEE-488 and IEEE-1000 microprocessors buses. 208 pp., 100 line drawings. **$14.50**

20N103 **Electronic Power Supply Handbook** *by Ian R. Sinclair* covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. All types of supplies used for electronics purposes are covered in detail, starting with cells and batteries and extending by way of rectified supplies and linear stabilizers to modern switch - mode systems, IC switch - mode regulators, DC-DC converters and inverters. 144 pp., 90 line drawings. **$16.25**

20N104 **Electronic Test Equipment Handbook** *by Steve Money* is a guide to electronic test equipment for the engineer, technician, student and home enthusiast. Provides a practical guide to widely used electronics instruments and the techniques of measuring a wide range of parameters in electronics systems. 216 pp., 123 line drawings. **$18.00**

20N105 **Digital Logic Gates and Flip-flops** *by Ian R. Sinclair*, what they do and how to use them. Seeks to establish a firm foundation in digital electronics by treating the topics of gates and flip-flops thoroughly and from the beginning. For the user who wants to design and troubleshoot digital circuitry with considerably more understanding of principles than the constructor, and who wants to know more than a few rules of thumb about digital circuits. 204 pp., 168 line drawings. **$18.00**

02C30 **The Commodore Ham's Companion** *by Jim Grubbs K9EI* 160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

10M44 **World Atlas** *by Radio Amateur Callbook Inc.* 20 pp. of full color, 8¾" x 10⅞", contains North Polar projection of the world; maps of all seven continents, West Indies/Caribbean area, and Pacific Ocean. **$5.00**

01C80 **Master Handbook of 1001 Circuits—Solid-State Ed.** *by Kendall Webster Sessions* With this outstanding reference in hand, electronics hobbyists and professionals will never have to search for schematics again. Completely updated, the book is thoroughly indexed and all 1001 circuits are clearly illustrated. 420 pp. **$19.50 soft cover**

09D22 **The World Ham Net Directory** *by Mike Witkowski* New—second edition now over 600 net listings. This book introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

10F091 **1991 International Callbook** The new 1991 International Callbook lists 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$29.95**

10D091 **1991 North American Callbook** The 1991 North American Callbook lists the calls, names, and address information for over 500,000 licensed radio amateurs in all countries of North America, from Panama to Canada including Greenland, Bermuda, and the Caribbean islands plus Hawaii and U.S. possessions. **$29.95**

05H24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. Indepth study of AC/DC fundamentals, SSB, antennas, amplifiers, power supplies, and more. **$29.50 hard cover only**

12E76 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Thoroughly revised in 1972. Covers the important aspects of applied electronics and electronics communications. 567 pp. **$10.95**

12E41 **Second Level Basic Electronics** *Prepared by the Bureau of Naval Personnel* Sequel to *Basic Electronics*, thorough treatment of the more advanced levels of applied electronics, Includes microwave receiving and transmitting. Hundreds of excellent diagrams. 325 pp. **$7.50**

01D45 **The Illustrated Dictionary of Electronics, 5th Ed.** *by Rufus P. Turner and Stan Gibilisco* Featuring more than 27,000 entries, an exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables, this is by far the most comprehensive dictionary of practical electronics and computer terms available. 720 pages **$26.95**

04M54 **GGTE Morse Tutor** From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5¼ floppy for IBM PC, XT, AT, PS/2 or compatibles **$19.50**

04M55 **Advanced Edition $29.95**

01T01 **Transmitter Hunting: Radio Direction Finding Simplified** *by Joseph D. Moell K0OV/Thomas N. Curtee WD6UZZ* 336 pps, 248 illusts. **$17.50**

20N091 **Most-Often-Needed Radio Diagrams and Servicing Information, 1926-1938, Volume One** *compiled by M.N. Beitman* An invaluable reference for anyone involved in Vintage Radio restoration. Hundreds of schematics, writing diagrams and parts lists, all from the original sources. **$11.95**

20N096 **How To Read Schematics (4th edition)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. This book is your key to unlocking the mysteries of schematics, beginning with a general discussion of electronic diagrams. **$14.95**

20N097 **Radio Operator's World Atlas** *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed as a constant desk top companion for radio operators, and as a replacement for the traditional bulky and outdated atlases. Also included are 42 pages of vital statistics about each country. Popular with DXers worldwide. **$17.95**

SHORTWAVE

06S57 • **1991 Passport to World Band Radio** *by International Broadcasting Services, Ltd.* You can have the world at your fingertips. You'll get the latest station and time grids, the 1991 Buyer's Guide and more. 384 pages. **$16.50**

07D91 **DXer's Directory, 1990–91 Edition** *compiled by Fred Osterman* Most complete list of radio listeners ever! Features over 1800 listeners from over 75 countries. Also included is full information on over 100 radio clubs worldwide. **$4.95**

15A002 **Scanner and Shortwave Answer Book** *by Bob Grove* Whether you have difficulty calculating world time zones, converting kilohertz to megahertz, or frequencies to meters, this book will provide the answers. **$13.95**

03S11 **Shortwave Receivers Past and Present** *edited by Fred J. Osterman* Concise guide to 200+ shortwave receivers manufactured in the last 20 years. Gives key information on each model including coverage, display, circuit type, performance, new value, used value, etc. Photos on most models. The Blue Book of shortwave radio value. 1987, 104 pages, 8½ x 11. **$6.95**

07R25 **The RTTY Listener** *by Fred Osterman* Compiles issues 1 through 20 of the RTTY Listener Newsletter. Contains up-to-date, hard-to-find information on advance RTTY and FAX monitoring techniques and frequencies. 156 pp. **$19.95**

01A87 **Shortwave Listener's Antenna Handbook** *by Robert J. Traister* Beef up shortwave reception capacity and increase listening enjoyment easily and inexpensively. **$12.00**

03C09 **Shortwave Clandestine Confidential** *by Gerry L. Dexter* Covers all clandestine broadcasting, country by country: tells frequencies, other unpublished information: spy, insurgents, freedom fighters, rebel, anarchist radio, secret radio. Current publication. 84 pages. **$8.50**

03M221 **US Military Communications (Part 1)** Deals with US Military communication channels on shortwave. Covers frequencies, background on point to point frequencies for the Philippines, Japan and Korea, Indian and Pacific Oceans, and more. 102 pages. **$12.95**

03M222 **US Military Communications (Part 2)** Covers US Coastguard, NASA, CAP, FAA, Dept. of Energy, Federal Emergency Management Agency, Disaster Communications, FCC, Dept. of Justice. From 14 KC to 9073 KC. 79 pages. **$12.95**

03M223 **US Military Communications (Part 3)** This part completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. 78 pages. **$12.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. Covers getting started, scanners and receivers, antennas, coaxial cable, accessories, computer controlled monitoring, more. **$14.95**

03S208 **Radioteletype Press Broadcasts** *by Michael Schaay* Covers schedules of Press Services by time, frequency, and country broadcasting in English, French, German, Spanish, and Portuguese. Detailed Press Agency Portraits. 120 pp. **$12.95**

11T88 **Tune In on Telephone Calls** *by Tom Kneitel K2AES* Formatted as a frequency list with detailed description of each service and its location in RF spectrum. Provides basic information for casual listeners getting started and details for ardent enthusiasts. **$12.95**

09P33 **The Pirate Radio Directory 1990 Edition** *by George Zeller* Contains data on some 100 pirate stations active during 1989. How to tune in pirate broadcasts and get QSLs from the stations. **$7.95**

03K205 **Guide to Radioteletype (RTTY) Stations** *by J. Klingenfuss* Updated book covers all RTTY stations from 3MHz–30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. 105 pp. **$12.95**

11AS10 **Air Scan Guide to Aeronautical Communications (5th Edition)** *by Tom Kneitel K2AES* Most comprehensive guide to monitoring aeronautical communication in the US. Expanded to cover all Canadian land airports and seaplane bases, plus listings for Central America, the Caribbean, North Atlantic, and the Pacific Territories. **$14.95**

07A66 **Aeronautical Communications Handbook** *by Robert E. Evans* Exhaustive, scholarly treatment of shortwave aeronautical listening. Well organized, up-to-date. 266 pp. **$19.95**

07R20 **A Radio Journal 1912–1940** *by Russ Rennaker W9CRC* A fascinating trip through time. Easy to read and informative, educational and entertaining. A trip down memory lane to the early days of radio. **$7.95**

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** *by Tom Kneitel K2AES* This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. 25 to 470 MHz. **$19.95**

01P68 **Pirate Radio Stations: Tuning Into Underground Broadcasts** *by Andrew R. Yoder* Comprehensive guide to tuning in, identifying, and contacting the most unpredictable stations on the radio spectrum. 192 pp. **$12.50**

11F52 **Ferrell's Confidential Frequency List** *compiled by A.G. Halligey* All frequencies from 4MHz–28MHz covering ship, embassy, areo, Volmet, Interpol, numbers, Air Force One/Two, more 376 pp. **$19.50**

11SR97 **National Directory of Survival Radio Frequencies** *by Tom Kneitel K2AES* Handy and concise reference guide to high interest communications frequencies required by survivalists. Includes chapter on building emergency communications antenna systems. **$8.95**

11SM11 **Scanner Modification Handbook** *by Bill Creek* Provides straight forward step-by-step instructions for expanding the operating capabilities of VHF scanners. Filled with interesting text, helpful photos, tables, and figures. **$17.95**

11EE06 **Guide to Embassy Espionage Communications** *by Tom Kneitel K2AES* Candid and probing examination of worldwide embassy and (alleged) espionage communication systems and networks. Extensive nation-by-nation directory of embassy stations is included. **$10.95**

15D91 **1991 Shortwave Directory (7th ed.)** *by Bob Grove* Extensively revised, the new 1991 Shortwave Directory is the consummate DXer's bible for the first 30 MHz of radio spectrum, including up-to-date and accurate VLF information as well. 270 information-packed and illustrated pages in convenient 8½ x 11 format professionally bound. **$21.95**

20N093 **Vintage Radio 1887-1929** *by Morgan E. McMahon* Recaptures the excitement of the early days. The authoritative reference book for historians and collectors. **$8.95**

20N094 **A Flick of the Switch, 1930-1950** *by Morgan E. McMahon* Here's your chance to recapture the thrill of old-time radio and television. Browse through a thousand photos and fascinating old ads. Discover the fast-growing hobby of radio collecting, and perhaps find a treasure in your own attic or cellar. **$8.95**

20N095 **World Broadcast Station Address Book** *by Gerry L. Dexter* A must for the serious shortwave listener. Hundreds of addresses for shortwave broadcast stations. Special sections with helpful information to increase your QSL percentage. **$8.95**

VIS Study Cards Advance the easy way with VIS Study Cards. Compact, Up-to-date Flash Cards with Key Words, Underlined, Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

NOVICE	VIS01	**$11.95**
TECH	VIS02	**10.95**
GENERAL	VIS03	**9.95**
ADVANCED	VIS04	**15.95**
EXTRA	VIS05	**14.95**

Lanze Code Programs—(Available on 5¼" disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
Novice	IBM01	COM01	$14.95
Tech	IBM02	COM02	$14.95
General	IBM03	COM03	$14.95
Advance	IBM04	COM04	$19.95
Extra (New Pool)	IBM05	COM05	$19.95

IBM#06, COM#06 IBM/Commodore Tech No Code—Lanze Code Program contains all the authorized FCC questions and answers used in testing formulas, schematic symbols, diagrams, and sample test for passing the new Technician No Code license. $24.95

IBM97 **Amateur Radio Part 97 Rules** (includes updated, revised Commission's Rules, September 30, 1989) 5¼" disk IBM compatible only. **$9.95**

ARRL BOOKS

AR1991 **ARRL 1991 Handbook (68th ed.)** 39 chapters, featuring 2,100 tables, figures and charts. The most comprehensive, well organized and affordable source of amateur radio reference material. 1232 pages. **$25.00**

AR2065 **ARRL Antenna Book** Represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. **$18.00**

AR1086 **ARRL Operating Manual** Packed with information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF, contesting. **$15.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization, and other interesting subjects. **$10.00**

AR2545 **Antenna Compendium Vol. 2** 42 papers covering verticals, yagis, quads, multiband and broadband systems, antenna selection, and much more. **$12.00**

AR2626 **Companion Software for Antenna Compendium Vol. 2** 51/4" MS-DOS floppy. **$10.00**

AR0488 **W1FB's Antenna Notebook** *by Doug DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$8.00**

AR0348 **QRP Notebook** *by Doug DeMaw W1FB* Presents construction projects for the QRP operator, from a simple 1 watt crystal-controlled transmitter to more complex transceiver designs. **$6.00**

AR4141 **W1FB's Design Notebook** *by Doug DeMaw W1FB* This plain language book is filled with simple practical projects that can be built using readily-available components and common hand tools. **$10.00**

AR2200 **Antenna Impedance Matching** *by Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **$15.00**

AR0402 **Solid State Design** Chock full of good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. **$12.00**

AR3193 **Weather Satellite Handbook (4th ed.)** *by Dr. Ralph Taggart* WB8DQT Hot off the press! Expanded and revised to reflect today's weather-fax satellite technology. **$20.00**

AR3290 **Companion Software for Weather Satellite Handbook** 51/4" MS-DOS Floppy. **$10.00**

AR1033 **The DXCC Companion** *by Jim Kearman KR1S* spells out in simple, straightforward terms what you need to be a successful DXer. **$6.00**

AR1250 **Log Book**—Spiral **$3.50**

ARA341 **Interference Handbook** Written from an RFI sleuth's perspective. His experience in solving interference problems. **$12.00**

AR2197 **Data Book** Valuable aid to the RF design engineer, technician, radio amateur, and experimenter. Commonly used tables, charts, and those hard-to-remember formulas. **$12.00**

AR2960 **Transmission Line Transformers (2nd ed.)** *by Dr. Jerry Sevick W2FMI* Practical designs and specific information on construction techniques and sources of material. More designs for antenna tuners, hybrids, and for the VHF and UHF bands. 272 pp. **$20.00**

ARRL **License Manuals** All the theory you need to pass your test. Complete FCC question pools with answers.

AR2375 **Technician Class**	**$6.00**
AR2383 **General Class**	**$6.00**
AR0166 **Advanced Class**	**$6.00**
AR2391 **Extra Class**	**$8.00**

AR0410 **Yagi Antenna Design**

Originally published as a series in *Ham Radio* , polished and expanded by Dr. Lawson. **$15.00**

AR0437 **ARRL Repeater Directory 1991–1992** Almost 18,000 listings with over 2200 digipeaters. Band plans, CTCSS (PL™) Tone Chart, compilation of frequency coordinators, ARRL Special Service Clubs, and 500 beacon listings from 14MHz to 24GHz. **$6.00**

AR2171 **Hints and Kinks** Find the answer to that tricky problem. Ideas for setting up your gear for comfortable, efficient operation. **$8.00**

AR3169 **QRP Classics** Collection of articles from last 15 years of ARRL publications on building receivers, transmitters, transceiver, accessories, 288 pp. **$12.00**

AR3185 **The Satellite Experimenter's Handbook, (2nd Ed.)** *by Martin Davidoff K2UBC* Expanded and revised, this 2nd edition of "The Satellite Experimenter's Handbook" is your guide to using and designing satellites, focusing on those built by and for the international radio amateur community. **$20.00**

AR0477 **Low Band Dxing** How to meet the challenges of the different forms of 160, 80, and 40 meter propagation with effective antennas, equipment, and operating strategies. **$10.00**

AR2030 **Your Gateway to Packet Radio (2nd ed.)** Tells everything you need to know about this popular new mode; how to get started, equipment you need, and more. **$12.00**

AR2456 **FCC Rule Book (8th ed.)** A must for every active radio amateur. **$9.00**

AR2103 **Satellite Anthology** The latest information on OSCARs 9 through 13 as well as the RS satellites. Information on the use of digital modes, tracking antennas, RUDAK, microcomputer, and more! **$5.00**

AR2898 **Space Almanac** *by Anthony R. Curtis K3KXK* Captures the breathtaking recent news from space. Includes information on Amateur Radio satellites. Find almost everything about man's trip to the stars. 960 pp. **$20.00**

AR2083 **Complete DX'er (2nd ed.)** *by Bob Locker W9KNI* Learn how to hunt DX and obtain hard-to-get QSL cards. **$12.00**

NEW STUFF

AR3291 **Now You're Talking!: Discover the World of Ham Radio** Successor to the immensely popular *Tune in the World with Ham Radio*. Covers everything you need to know to earn your first Amateur Radio license. More than a study guide, this book will help you select equipment for your ham radio station and explain how to set it up—everything you'll need to know to get on the air! An ARRL Publication. **$19.00**

AR3292 **Your Introduction to Morse Code: Practice Cassettes** Companion code course to Now You're Talking!, this kit includes two 90 minute cassette tapes. Prepares you for the 5 WPM Morse code exam to earn your Novice license or add high-frequency worldwide communications privileges to your code-free Technician license. **$10.00**

20N098 **Ham Stuff—The Who—What—Where of Amateur Radio** This is the indispensable new guide to everything in Ham Radio. If you want to know who's on first and what's what, this valuable guide belongs in your shack. You'll refer to it again and again to find just the right equipment, where to shop, and who to call. Everything from radios to QSL cards to hat pins, complete with product descriptions, vendor profiles, prices, and more. **$19.95**

20N099 ***73* Clock** This traditional 24 hour clock will look great on the wall of your shack. The bright *73* logo welcomes visitors to your operating position, while showing your obvious good taste in ham radio magazines. **$39.95**

BOOKS FOR BEGINNERS

01B65 **The Beginner's Handbook of Amateur Radio—2nd Editon** *by Clay Laster* Combines theory and practice in an easy-to-understand format, and provides information for choosing and installing radio receivers and transmitters, antennas, transmission lines, and test equipment. 400 pages, 291 illustrations. **$18.50**

20N092 **The Wonderful World of Ham Radio** *by Richard Skolnik, KB4LCS* This book addresses the plea that something simple, clear, and fun be written to introduce young people to amateur radio. Pick-up one for the new ham in your life. **$7.95**

20N099 **Digital Electronics Projects for Beginners** *by Owen Bishop* contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. 128 pp., 56 line drawings. **$12.50**

20N100 **Electronics Build and Learn (2nd edition)** *by RA Penfold* combines theory and practice so that you can 'learn by doing.' Full construction details of a circuit demonstrator unit that is used in subsequent chapters to introduce common electronic components. Describes how these components are built up into useful circuits, oscillators, multivibrators, bistables, and logic circuits. 128 pp., 18 photos, 72 line drawings. **$12.50**

AR2073 **Novice Antenna Notebook** A beginners guide to easy and effective antennas and tuners you can build. **$8.00** An ARRL Publication.

AR2871 **W1FB's Help for New Hams** *by Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **$10.00** An ARRL Publication.

AR2286 **First Steps in Radio** *by Doug DeMaw W1FB* Series of *QST* articles. See components assembled into practical circuits and how the circuits make up your radio gear. **$5.00** An ARRL Publication.

ANTENNAS

05A95 • **Easy-up Antennas for Radio Listeners and Hams** *by Edward M. Noll* Like to learn how to construct low-cost, easy-to-erect antennas? *Easy-up Antennas* will help you. **$16.50**

10A345 • **Beam Antenna Handbook** *by William Orr W6SAI/Stuart Cowan W2LX* Yagi beam theory, construction, operation. Wire beams. SWR curves. Matching systems. A "must" for serious DXers. **$11.95**

10A343 • **All About Cubical Quad Antennas** *by William Orr W6SAI/Stuart Cowan W2LX* The "Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$9.50**

10A344 • **The Radio Amateur Antenna Handbook** *by William Orr W6SAI/Stuart Cowan W2LX* Yagi beam theory, construction, operation. Wire beams. SWR curves. Matching systems. A "must" for serious DXers. **$11.50**

10A346 • **Simple, Low-cost Wire Antennas for Radio Amateurs** *by William Orr W6SAI/Stuart Cowan W2LX* All New! Low-cost, multi-band antennas; inexpensive beams. "Invisible" antennas for hams in "tough" locations! New data. **$11.50**

10A342 • **All About Vertical Antennas** *by William Orr W6SAI/Stuart Cowan W2LX* Effective, low-cost verticals 10–160 m. -DX, multiband; compact verticals for small spaces; grounding; test equipment; lightning. **$10.50**

01A70 • **Practical Antenna Handbook** *by Joseph J. Carr* Design, build, modify, and install your own antennas. Carr, a 20-year veteran of technical writing, has a unique ability to present complex technical concepts in an easy-to-understand way. 416 pp. **$21.50**

PACKET

10A347 **All About VHF Amateur Radio** *by William Orr W6SAI* DX propagation, VHF yagi and quad beams, repeaters and how they work, OSCAR satellites and how to use them. **$11.95**

03R02 **RTTY Today** *by Dave Ingram K4TWJ* Only up-to-date RTTY book in existence. Covers all facets of RTTY. Most comprehensive RTTY guide ever published. Fully illustrated. 112 pages. **$8.50**

09V11 **The Basic Guide to VHF/UHF Ham Radio** *by Edward M. Noll* This book provides a first rate introduction to life on the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. **$6.50**

16PB6 **Packet User's Notebook** *by Buck Rogers K4ABT* Over 90 diagrams show tried and true connections for popular TNCs, transceivers, and computers. A genuine nuts-and bolts how-to-do manual. **$9.95**

01P22 **The Packet Radio Handbook** *by Jonathan L. Mayo KR3T* "...an excellent piece of work. Well worth reading for both the experienced and the new packeteer...the definitive guide to amateur packet operation." —Gwyn Reedy W1BEL **Only $14.50**

CODE TAPES

One answer to the no-code brou-ha-ha is to make the code so simple to learn that it's a non-problem. Herewith the world's easiest code course—tens of thousands of hams have gotten their licenses this amazing new shortcut way. It's failure-proof. Most people are able to whip through the Novice test after spending less than three hours each on Genesis and The Stickler. People who have given up on other code courses find this one does the job in a jiffy. Going after your General? It's about time. Use the Back Breaker and you'll be there before you know it. A week should do it. Warning, 20wpm code almost invariably appears to cause irreparable, irreversible, permanent brain damage. Uncle Wayne accepts no responsibility whatever for anything that happens to those who are foolish enough to use the Courageous 20wpm tape.

73T05 **"Genesis"** **$5.95**
5 wpm—This is the beginning tape, taking you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

73T13 **"Back Breaker"** **$5.95**
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

73T06 **"The Stickler"** **$5.95**
6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

73T20 **"Courageous"** **$5.95**
20+ wpm—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run: You'll wonder why the examiner is sending so slowly!

Uncle Wayne's Bookshelf Order Form

You may order by mail, telephone, or fax. All payments are to be in US funds. Allow 3 weeks for delivery.

Item #	Title	Qty.	Price	Total
			SHIPPING	
			TOTAL	

SHIPPING
U.S. add $3.00 mail, $4.00 UPS.
Canada add $4.00 mail.
U.P.S. to Canada and all foreign orders FOB Peterborough, NH.

Name _____

Street _____

City _____ State _____ Zip _____

TOTAL $ _____ ☐AE ☐MC ☐VISA ☐Check/Money Order

Card # _____ Expiration Date _____

Telephone: (603) 924-4196 (800) 234-8458 FAX: (603) 924-8613

Mail: *73 Magazine*, Attn. Uncle Wayne, PO Box 3080, Peterborough, NH 03458

UW0991

IC-W2A

IC-24AT

ICOM

IC-2410

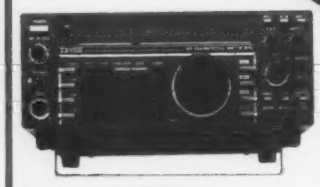
IC-3220H

IC-765

IC-781

IC-229H

Oklahoma Comm Center


IC-735

IC-2SAT

IC-2GAT

HUSTLER rfconcepts ARRL PC Electronics

YAESU TEN-TEC ALINCO Larsen Antennas Ameco

Outbacker Antennas cushcraft CORPORATION W5YI MFJ DIAMOND ANTENNA

AEA Nye-Viking Kantronics M^2 ENTERPRISES

Ramsey Kits TELEX hy-gain Bug Catcher COMET

SPECIAL SPECIAL

CALL

For This Month's Special-Buy
Some Quantities Are Limited

CALL TOLL FREE **1-800-70K-HAMS**

1-800-765-4267

Oklahoma Comm Center

FREE SHIPPING UPS SURFACE (except towers/antennas)

9500 Cedar Lake Ave., Suite 100
Oklahoma City, Oklahoma 73114
Local & Info (405) 478-2866 FAX (405) 478-4202

VISA C.O.D.

Hours of Operation
M-F 10-6
Sat 10-3

Take It With You.

FT-5200

144 and 440MHz

FT-6200

440MHz and 1.2G

Trunk-Mountable High Power Dual Band VHF/UHF Transceiver

The FT-5200 (or FT-6200) Dual Band Mobile Transceiver is more than just another pretty face. The front panel can be easily removed without tools or fuss and put into your pocket when you leave your car. And for extra convenience, an optional remote cable kit is available so you can mount the control panel anywhere on the dash and the transceiver underneath a seat, in the glove box or in the trunk.

For extremely powerful communications capabilities (50 watts on 2m/35 watts on 70cm) with maximum convenience and equipment security, face the facts and choose Yaesu.

Features and Options:

- Memories: 16 tunable memory channels for each band.
- Channel Steps: 5, 10, 12.5, 15, 20, 25kHz.
- Removable Front Panel for quick and easy installation.
- CTCSS Encode Built-In: 38 sub-tones selectable from the front panel.
- Dual Receive: With independent squelch and mixing balance.
- Full Duplex Cross Band Operation: Transmit on one band while listening on the other.
- Independent TX/RX Frequencies: Odd Splits ok on any memory channels.
- Programmable Subband Limits: For band scanning.
- Selectable Scan Skip: For reduced scanning time.
- One-Touch Instant Recall: Recall of CALL channels for each band.
- Priority Monitoring.
- Dual External Speaker Jacks: One for each band.
- Built-In Antenna Duplexer: For one antenna operation.
- [illegible] Automatic Display/Key Lighting Dimmer.
- Microphone: Backlit DTMF display for night operation.
- Accessory Options: FRC-4 (Pager Unit), DVS-3 (Voice Memory Unit), YSK-1L (6m Trunk Mounting), FTS-22 (CTCSS Decoder), SP-7 (External Speaker).

Specifications:

- Frequency Range: FT-5200: 2m, 144–148MHz; 70cm, 430–450MHz and FT-6200: 70cm, 430–450MHz; 23cm, 1240–1300MHz
- RF Output Power: 2m, 50/5 W (high/low); 70cm, 35/5 W (high/low); 23cm, 10/1 W (high/low)
- Dimensions (WHD): 5⅞ x 1⅞ x 5⁹⁄₁₆ in. (w/o knob)
- Weight (approx.): 2 lbs. 3 oz.

(Shown Actual Size)

YAESU

*Performance without compromise.*SM

© 1990 Yaesu USA, 17210 Edwards Road, Cerritos, CA 90701.
Specifications subject to change without notice.
Specifications guaranteed only within amateur bands.

KENWOOD

The only transceiver that could replace our best seller

The TS-450S.

Kenwood's goal is to always offer our customers the most sophisticated achievements in technology. So, when it came time to enhance our best selling TS-440S transceiver, we didn't hesitate.

The resulting TS-450S and TS-690S transceivers offer a combination of versatility, flexibility, sensitivity, and selectivity unparalleled in their price range.

The TS-450S offers competition class reception and 100 W transmission capabilities on all nine Amateur bands in SSB, CW, FM, and FSK modes, with 40 W on AM. The TS-690S also offers 50 W on six meters.

For amazingly clear reception, Advanced Intercept Point (AIP), greatly improves the receiver's dynamic range to an incredible 108 dB. An optional Digital Signal Processor, DSP-100, offers even further sound clarity by tailoring the incoming and outgoing audio passband signals.

You'll find the TS-450S and TS-690S provide truly outstanding sensitivity over the entire band. Innovative "triple conversion" also assures superior stability and accuracy, particularly above 24.5 MHz, for improved DXing.

Other refinements include: convenient split frequency operation, advanced filter functions, optional automatic antenna tuner, and 100 memory channels with flexible scanning selections.

Accessories include: **PS-33** 20.5A power supply, **PS-53** 22.5A heavy duty power supply, **SP-23** external speaker, **AT-450** internal automatic antenna tuner, **AT-300** external automatic antenna tuner, **DSP-100** digital signal processor unit, **VS-2** voice synthesizer, **SO-2** TXCO, **MB-430** mobile mount, **PG-2X** DC cable, **TU-8** CTCSS encoder, **YG-455C-1** 500Hz CW filter for 455kHz IF, **YG-455CN-1** 250Hz CW narrow filter for 455kHz IF, **YK-88S-1** 2.4kHz SSB filter for 8.83MHz IF, **YK-88SN-1** 1.8kHz SSB filter for 8.83MHz IF, **YK-88C-1** 500Hz CW filter for 8.83MHz IF, **YK-88CN-1** 270Hz CW filter for 8.83MHz IF, **YK-455C-1**, 500Hz CW filter for 455kHz IF

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

Kenwood meets or exceeds all specifications. Contact your dealer for a complete listing of specifications and accessories. Specifications are subject to change without notice. Complete service manuals are available for all Kenwood transceivers and most accessories. One year warranty in the U.S.A. only.

KENWOOD

. . . pacesetter in Amateur Radio